PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BCHydro

BRITISH
COLUMBIA

Wildlife Distribution and Habitat Use in The Northern Williston Reservoir Area, British Columbia, Winter 1990

D. F. Hatler
April 1990

PWFWCP Report No. 3

105-00902/

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

Citation: D. F. Hatler. April 1990. Wildlife distribution and habitat use in the northern Williston Reservoir area, British Columbia, winter 1990. Peace/Williston Fish and Wildlife Compensation Program, Report No. 3. 17pp plus appendices.

Author(s): David F. Hatler[1]
Address(es): [1] Box 5, Smithers, B.C. V0J 2N0

TABLE OF CONTENTS

	PAGE
1. INTRODUCTION	1
2. STUDY AREA AMD OBJECTIVES	1
3. METHODS AND CONDITIONS	1
3.1 Survey Characteristics	1
3.2 Navigation, Mapping, and Note-taking	3
3.3 Survey Conditions	3
4. RESULTS AND DISCUSSION	4
4.1 General	4
4.2 Moose	5
Numbers and Composition	5
Distribution	8
Habitat Characteristics and Use	8
Elevation	12
Snow Cover Effects	12
4.3 Other Ungulates	12
Caribou	12
Elk	13
Mule Deer	13
Mountain Goat	13
Stone's Sheep	15
4.4 Other Mammals	15
4.5 Birds	15
5. HABITAT CONSIDERATIONS	16
6. RECOMMENDATIONS	16
7. LITERATURE CITED	16
APPENDICES:	
Appendix 1. Detailed report on aerial survey results	18
Appendix 2. Summary of observation data from the surveys	43
Appendix 3. Small format maps showing survey flight lines and observations	50

LIST OF TABLES

Table No.		Page
1)	Characteristics of ungulate observations during aerial surveys in the northern Williston Reservoir area, 20-25 February 1990	6
2)	Summary of ungulate numbers and composition from the north Williston Reservoir area, 20-25 February 1990	7
3)	Distribution of moose, by habitat type and elevation, in the northern Williston Reservoir area, B. C., February 1990	10

LIST OF FIGURES

Figure No.		Page
1)	The northern Williston Reservoir study area	2
2)	Distribution and relative abundance of moose in the northern Williston Reservoir area	9
3)	Comparison of moose winter habitat use in the southern Williston Reservoir area (February 1989) and the northern reservoir area (February 1990)	11
4)	Comparison of mountain goat locations in uplands west of the Lower Ospika River, September 1988 and February 1990	14

WILDLIFE DISTRIBUTION AND HABITAT USE IN THE NORTHERN WILLISTON RESERVOIR AREA, BRITISH COLUMBIA, WINTER 1990

1. INTRODUCTION

This report documents the results of wildlife surveys undertaken in February 1990, in selected uplands and along drainages north of the Omineca Arm in Williston Reservoir. Those surveys were essentially a continuation of inventory activities along the southern half of the reservoir, completed the previous year, and the introduction for the report pertaining to that work (Hatler 1989) provides a historical perspective and rationale applicable to the study in both years. Summarily, the 1989 and 1990 surveys are preliminary management activities responding to and supported by the Williston Compensation Agreement, which seeks to restore some of the wildlife habitat and population losses suffered due to flooding behind the W.A.C. Bennett Dam on the Peace River, west of Hudson Hope (Sumanik and Harrison 1968, Bonar 1975, MOE 1982, MOE 1983, MOE 1989a). The moose was a focal species in all of the sources cited above, and in the southern Williston surveys (Hatler 1989).

2. STUDY AREA AND OBJECTIVES

The study area for the 1990 work, as designated by the B.C. Ministry of Environment (MOE), consisted of most of administrative management unit (M.U.) 7-37, and selected drainages and uplands in M.U.'s 7-38 and 7-39 (south side of Ingenika Valley), 7-40 (north side of Ingenika R. and west side of upper Finlay R. to Fort Ware), and 7-41 (east shore of the Upper Finlay R., and all or portions of tributaries such as the Akie River and Pesika Creek (Fig. 1). The primary objective for the surveys in those areas was to conduct a "multi-species inventory", to provide detailed data on distribution, habitat use, and population composition of ungulates in the area. Thus, the primary difference between the 1989 and 1990 work was that the former was oriented primarily to moose, with data on other species obtained only incidentally, but that specific effort was made to assess other species (ungulates) in 1990. Again, observations of non-ungulate wildlife were also of interest, and were to be recorded opportunistically.

3. METHODS AND CONDITIONS

3.1 Survey Characteristics

The primary data gathering was accomplished by over 30 hours of aerial surveys, in a Bell 206 (Jet Ranger) helicopter, over the period 20-25 February 1990. As in 1989, the surveys were reconnaissance in nature, intended to

Fig. 1
The northern Williston Reservoir study area in northcentral B.C.

Scale: 1:600 000

provide a reasonably full exploration of the designated study area rather than statistically reliable population estimates. Thus, completely systematic flight lines were neither required, nor appropriate. Rather, particular areas were pre-selected for coverage, considering logistical and weather factors, but the specific flight path was determined while the survey was in progress. Relatively open habitats such as riparian shrub, bogs, burns, and deciduous forest were emphasized while, because of visibility limitations, expanses of conifer cover were mostly ignored. The intent for most lowland areas was to observe at least local samples of all prospective moose wintering habitats in each area, and to classify (male, female, juvenile) all animals observed. Uplands, where species such as caribou and mountain goats were the focus, were covered more systematically, usually following contours around mountain blocks. Flight speed during intensive searching averaged about 80-90 km/hr, and altitude above ground level varied from about 50 to 150m, depending upon local light conditions and vegetative cover characteristics.

3.2 Navigation, Mapping, and Note-taking

As in 1989, the maps used for navigation and primary data recording were all from the National Topographic Series, at a scale of 1:50 000. Flight lines, locations/numbers of animals and sign, and occasional habitat notes were all recorded directly on the maps, in flight. A small hand-held tape recorder was used concurrently to log composition data and more expansive notes on each observation or on local habitats, as required. Navigation was primarily by natural terrain features (streams, lakes, relief), as depicted on the flight maps. In addition, based on experience in 1989, forest cutblocks were added to all maps before the flights, and were useful to reference locations of observations and flight lines in some areas. Most wildlife observations, except in the case of smaller species such as grouse, were numbered both on the map and in the narrative description, to facilitate referencing during both analysis and reporting. One "observation" consisted of single animals, or of groups (two or more that were either clearly together behaviorally or within 50-75 m of each other).

3.3 Survey Conditions

Hatler (1989) discussed factors other than flight and crew characteristics that may affect the results of winter surveys. Those factors are primarily climatic, including annual and local variation in snow conditions, short term effects of snow accumulation patterns, and insolation and visibility effects.

In regard to annual variation, the available evidence suggests that snowpack in the study area at survey time in 1990 was, as in 1989, well above average. In the Williston (Peace) drainage, the 1 March water equivalent readings (MOE 1990) for selected stations around the study area, expressed as per cent of normal, were as follows: Upper Ware (134%), Lower Ware (155%), Lady Laurier Lake (130%), Frederickson Lake (137%), Upper Germansen (109%), and Morfee Mountain (132%). Actual 1 March 1990 snow depths at those sites ranged from 123% (Upper Germanson) to 154% (Lower Ware) greater than at that time the previous year (MOE 1989b, 1990), although warm early winter conditions resulted in lower snowpack at some lowland sites (e.g., Mackenzie, 1990 = 50% of 1989). The mountain snowpack through 1 March in 1989 was reportedly the highest since 1976 (MOE 1989b), thus it is apparent that the 1990 surveys were carried out in another year in which animal distribution, particularly in the case of moose, should have been dictated more by the environment than by "choice".

As discussed in Hatler (1989), even in high snowfall winters various microclimatic factors combine to result in some locations having less snow than others. To help explain the animal distribution observed in the 1989 surveys, measurements of snow depth were taken at several sites throughout the study area. Only a few such measurements were taken in 1990, because an extensive series of snowdepth records had been obtained by MOE staff just a week earlier (R. Dawson, pers. comm).

Flying and visibility conditions were generally good throughout the study period, with at least partly clear or high overcast skies on most days, and with no significant precipitation; the most significant negative effect was wind, which prevented operation in the mountains on some days. Temperatures were unseasonably warm, rising above 0° C on most days, and up to 7° C on the 25th, although the animals (and observers enclosed in the helicopter bubble) had less direct sunshine to contend with than was the case in 1989. The last snowfall prior to the surveys was reportedly on 15 February, thus tracks had been accumulating for 5 days before the surveys began, and for 10 days by the time they had been completed.

4. RESULTS AND DISCUSSION

4.1 General

As in 1989, the focus of these surveys was description, not analysis, intended primarily to provide managers with a useable database. The basic narrative description of survey results is given in Appendix 1, a detailed

flight report organized chronologically over the study period and covering all wildlife species observed. Location and environmental data relating to each observation are summarized in tabular form in Appendix 2. That compilation, which is the most amenable to detailed data analysis, is also being provided as part of the report package on floppy disk (spreadsheet file "WILLISTN.WRI", prepared in Symphony 1.1). Also as in 1989, two sets of maps have been prepared. The first is a folio of the 19 full-sized (uncut) topographic mapsheets within which at least some survey coverage was obtained. Because such large maps have a way of becoming separated from the applicable reports in government files, or may at times be inconvenient for the user, a second set of 59 page-size maps, at the same scale and bearing the same information as the large maps, is included here as Appendix 3.

Table 1 summarizes species composition and group size data for the 311 observations of wild ungulates during the 1990 work. As shown, despite the general multi-species orientation of the surveys, more than 85 per cent of the groups and 75 per cent of the animals observed were moose. Table 2 lists population composition data for the six ungulate species observed, both by management unit and in total. Contract time available does not permit extensive analysis and discussion of the survey data. However, following species accounts provide some highlights.

4.2 Moose

Numbers and Composition - The total number of moose observed in 1990 was only slightly less than that in 1989, despite a survey effort (flight hours) that was at least 30% less. The greater "efficiency" indicated for 1990 is due primarily to the relative concentration of animals in a few key areas, particularly the burns in the Akie, Ospika-McCusker, and Ingenika drainages, and on the south-facing slopes along Ospika Arm. Of the 423 moose observed, all were classified to adult/young categories, and all but 8 of the adults were classified to sex. The table below briefly compares composition and group size data for the total samples obtained in the two study years:

	Male		Female		Juv.		Uncl.			Ratios (per 100 cows)		Mean
Yr	No.	(%)	No.	(%)	No.	(%)	No.	(%)	Total	Bulls	Calves	Grp Size
89	133	(30)	227	(51)	69	(15)	20	(4)	449	58.6	30.4	1.9
90	205	(48)	148	(35)	62	(15)	8	(2)	423	138.5	41.9	1.6

TABLE 1. CHARACTERISTICS OF UNGULATE OBSERVATIONS DURING AERIAL SURVEYS IN THE NORTHERN WILLISTON RESERVOIR AREA, 20-25 FEBRUARY 1990.

SPECIES	GROUPS NO.	GROUPS %	ANIMALS NO.	ANIMALS %	MEAN GROUP SIZE
Moose	268	86.2	423	75.0	1.6
Caribou	9	2.8	32	5.7	3.6
Elk	9	2.8	27	4.8	3.0
Mule Deer	2	0.7	9	1.6	4.5
Mountain Goat	22	7.1	70	12.4	3.2
Stone's Sheep	1	0.4	3	0.5	3.0
Totals	311	100.0	564	100.0	

TABLE 2. SUMMARY OF UNGULATE NUMBERS AND COMPOSITION FROM THE NORTH WILLISTON RESERVOIR AREA, 20-25 FEBRUARY 1990.

SPECIES M.U.	M	F	J	A	U	Total	Per Cent Juv.	Juv./ 100 F	Males/ 100 F
MOOSE									
7-37	127	84	32	7	0	250	12.8	38.1	151.2
7-39	4	9	3	0	0	16	18.8	33.3	44.4
7-40	12	30	14	1	0	58	24.1	46.7	43.3
7-41	61	25	13	0	0	99	13.1	52.0	244.0
ALL	205	148	62	8	0	423	14.7	41.9	138.5
CARIBOU									
7-37	0	1	1	5	0	7	14.3	-	-
7-41	2	10	6	7	0	25	24.0	-	-
ALL	2	11	7	12	0	32	21.9	-	-
ELK									
7-37	2	0	0	0	0	2	-	-	-
7-40	2	1	0	0	0	3	-	-	-
7-41	8	0	0	0	14	22	-	-	-
ALL	12	1	0	0	14	27	-	-	-
MULE DEER									
7-37	0	1	2	1	5	9	-	-	-
MOUNTAIN GOAT									
7-37	5	6	12	15	24	62	19.4[2]	-	-
7-41	1	1	1	5	0	8	12.5	-	-
ALL	6	7	13	20	24	70	18.6[2]	-	-
STONE'S SHEEP									
7-41	0	3	0	0	0	3	-	-	-

[1]Composition: Males, Females, U-Adult -- all known yearling or older; Juv = young-of-the-year (about 9-10 months old at survey time); uncl. = animals only seen briefly, and neither sex nor age determined.
[2]Minimum figure--some unclassified animals may have been juveniles.

Only 7 (2.6%) of the 268 groups observed in 1990 consisted of more than three animals, as compared to 13 of 241 (5.4%) in 1989, and the maxima for the two years were 4 and 11, respectively. Those results are reflected in the lower mean group size, shown above, for 1990, and probably result at least partly from the fact that within-habitat dispersal is more easily accomplished in the main occupied habitats in the north Williston area (large burns, expanses of deciduous forest) than in the cutblocks of south Williston.

The most dramatic difference between the two sets of data is in the bull component. The preponderance of bulls in the 1990 sample, with a ratio (bulls:100 cows) that is more than double that recorded in 1989, is due to the results from the two most pristine M.U.'s, 7-37 and 7-41. Along the Ingenika River (M.U. 7-40) the bull component, at 47:100 cows (Table 2), is more similar to (even somewhat less than) that obtained for M.U.'s 7-29 and 7-30 in 1989. These differences may reflect differences in human access/harvesting, although it seems unlikely that bulls actually outnumber cows in local populations. Thus, possibly either bulls are less migratory than cows in the northern units, or are more conspicuous. As I have speculated previously (Hatler 1989 and elsewhere), cows with calves in particular may tend to stay widely dispersed, and select habitats, such as thick conifer cover, in which they are less readily seen.

Distribution - As was the case in 1989, the group size data suggest a considerable dispersion of animals. However, the distribution was far from homogeneous throughout the study area. Figure 2 provides a summary view of moose distribution and relative abundance in the area, as compiled for the page-size maps in Appendix 3. It is important to point out that the results in Figure 2 may be biased, due to unequal survey effort between map units. However, the survey effort expended in each was largely in response to the presence/absence of sign and/or "suitable" habitat features.

Habitat Characteristics and Use -- Table 3 summarizes the occurrence of all moose sightings in 1990, by sex and age class, in relation to several distinct habitat categories and to elevation. Figure 3 compares the habitat affinities of the 1989 and 1990 samples, with all classes lumped. The most striking difference is in the dominance of burns as winter habitat in the relatively pristine north, as compared to primary use of forest cutblocks in the south. There was also substantially more use of riparian habitats in the north, probably owing primarily to the fact that the lower reaches of many of the stream systems in that area are above the hydro-flood zone. An important point, given the apparent importance of cutblocks and burns for the Williston

Fig. 2. Distribution and relative abundance of moose in the northern Williston study area, Feb. 1990.

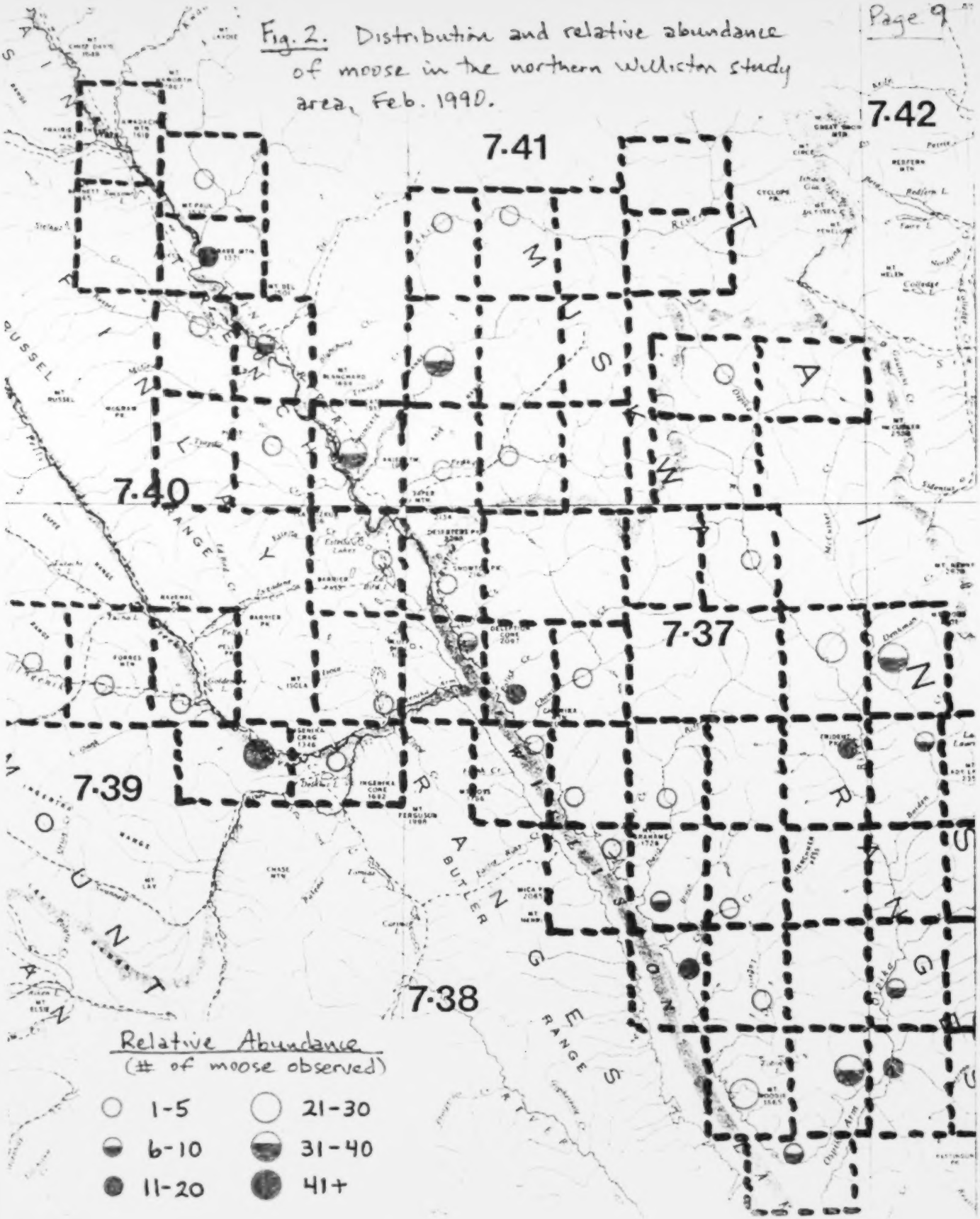


Fig. 2. Distribution and relative abundance of moose in the northern Wellington study area, Feb. 1990.

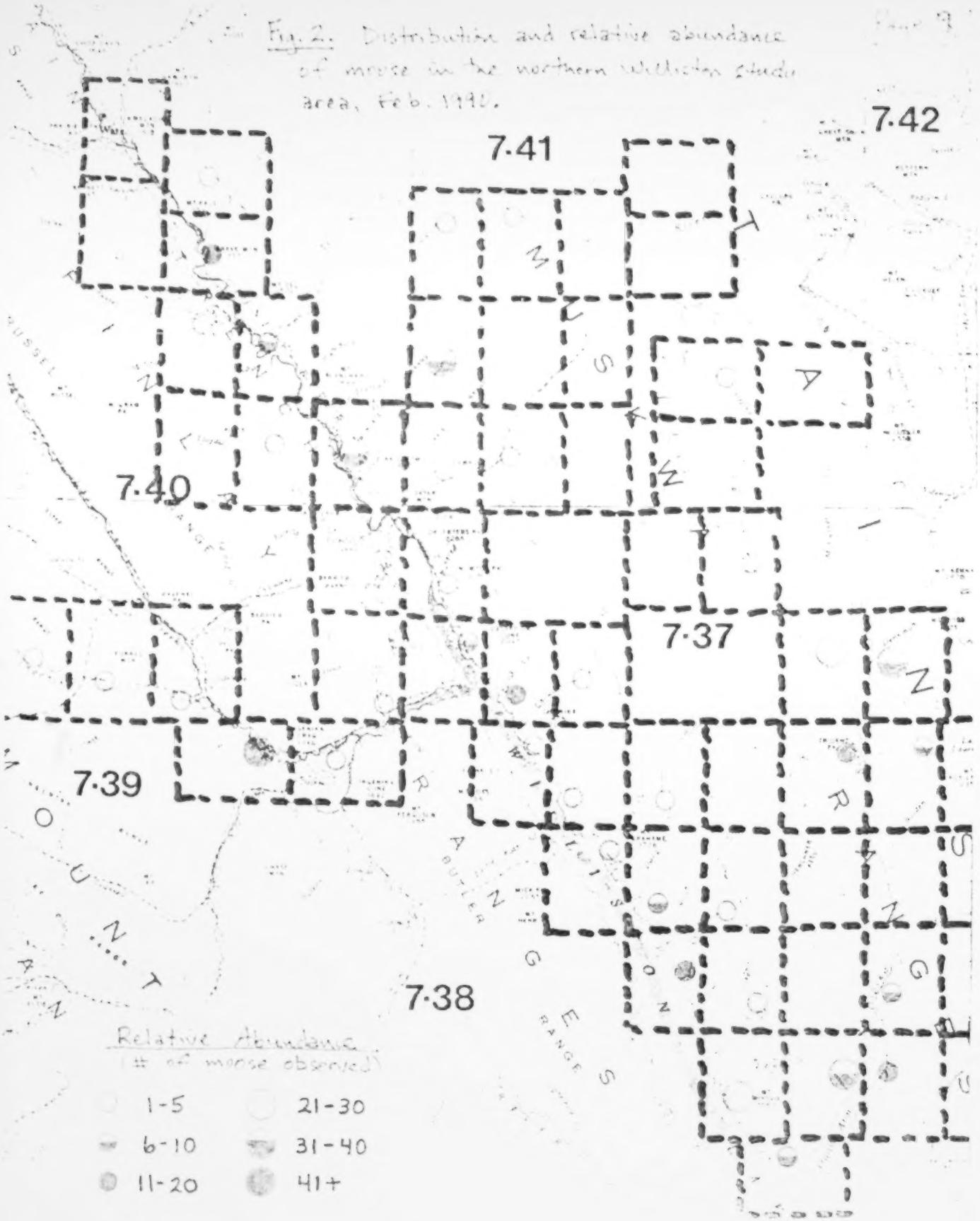


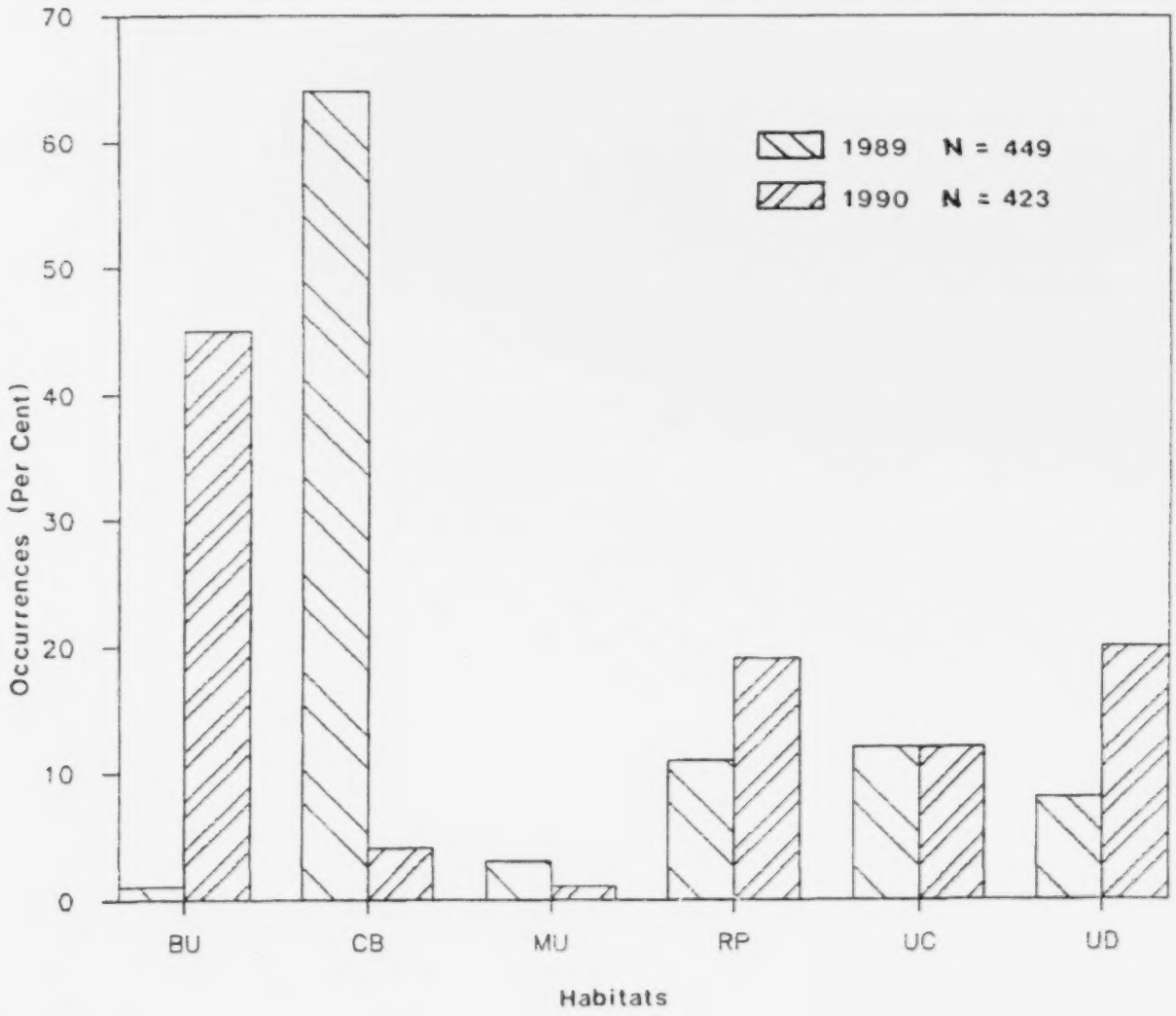
TABLE 3. DISTRIBUTION OF MOOSE, BY HABITAT TYPE AND ELEVATION, IN THE NORTHERN WILLISTON RESERVOIR AREA, BRITISH COLUMBIA, FEBRUARY 1990.

HAB.[1]	GROUPS NO.	%	MOOSE NO.	%	MALES NO.	%	FEMALES NO.	%	JUV NO.	%	U-ADULT NO.	%	UNCL NO.	%	MEAN ELEV. (m)[2]
BU	121	45	192	45	96	47	68	46	25	40	3	38	0	0	980
CB	6	2	9	2	5	2	4	3	0	0	0	0	0	0	729
CT	5	2	7	2	2	1	4	3	1	2	0	0	0	0	735
MX	25	9	39	9	17	8	14	9	6	10	2	25	0	0	854
MM	2	1	3	1	2	1	0	0	0	0	1	13	0	0	700
RS	36	13	60	14	28	14	22	15	9	15	1	13	0	0	775
RT	10	4	21	5	10	5	8	5	3	5	0	0	0	0	688
UC	10	4	13	3	7	3	4	3	1	2	1	13	0	0	773
UD	53	20	79	19	38	19	24	16	17	27	0	0	0	0	852
ALL	268		423		205		148		62		8		0		884

[1]Habitats:
BU -- Burn (where distinguishable from regenerating cutblocks).
CB - Forest cutblock.
CT -- Timber immediately beside a forest cutblock.
MX - Mixed forest (conifer/deciduous).
MU -- Muskeg, bog.
RS -- Riparian shrub (mostly willow and/or alder).
RT - Riparian timber (mostly cottonwood).
UC - Upland conifer (dominated by spruce and/or pine).
UD - Upland deciduous (dominated by aspen or birch).

[2]Elevation: taken from the helicopter altimeter for most observations on upland slopes and estimated from mapped locations in the flatlands; all estimated to the nearest 25 m.

Figure 3. Comparison of moose winter habitat use in the southern Williston Reservoir area (February 1989) and the northern reservoir area (February 1990. The number of moose in each sample is given by "N".



Reservoir area as a whole, is that both of those habitats are of the "transient" type described by Geist (1971), and are in danger of being lost to succession, silviculture, or both. In that sense, intensive forest management (including fire suppression) could seriously conflict with moose management objectives in the area, and will therefore be an important consideration in planning.

Elevation - The mean elevation for moose sightings in the 1990 survey area (Table 3) was 884 m (about 2900'). That is about 85 m higher than the average for the 1989 sample, but is due largely to the fact that many of the animals observed in burns were wintering at relatively high elevation, up to 1250 m, and over 40% of those in burns were above 900 m. A total of 62% of moose groups observed in the southern Williston area (Hatler 1989) were found at elevations within 100 m of the reservoir level (i.e., at or below 775 m). By contrast, only 34% of the groups observed in 1990 were that low. These results probably reflect varying responses to local snow conditions and possibly predator distribution as well as habitat features per se, but more intensive research will be required to ascertain which factors are paramount.

Snow Cover Effects -- It is beyond the scope of this report to compile and analyze the snow depth data gathered in the study area by MOE shortly before the surveys. In general it appears that lowlands with accumulations of 80-90 cm or more of snow (e.g., portions of the upper Ospika Valley and flatlands fronting on Finlay Reach south of Chowika Bay) were not being heavily used by moose, in agreement with the findings of Eastman (1977). However, some areas with low snow (e.g., the Finlay in the vicinity of Finbow) also showed little use while others, such as the Ingenika Valley, supported numerous animals, and the concentration of moose in the Upper Ospika-McCusker Creek burn occurred despite an apparently deep snow cover in that area.

4.4 Other Ungulates

Details on observations of other ungulates observed during the surveys are presented in Appendix 1 and summarized in Appendix 2. The relevant data on numbers and composition, summarized by management unit, are given in Table 2. Following are summary statements for the five species observed.

Caribou -- A total of 32 animals were seen during the official surveys, all in alpine habitat at elevations ranging from 1375-1850 m. Of that total, 7 were found in uplands along the west side of the Ospika River, from Trident Peak southward (M.U. 7-37). Hatler (1988) observed 14 caribou in that area incidentally, during a mountain goat survey in September 1988. The remaining 25 animals were all on windswept ridges facing generally north over the Akie

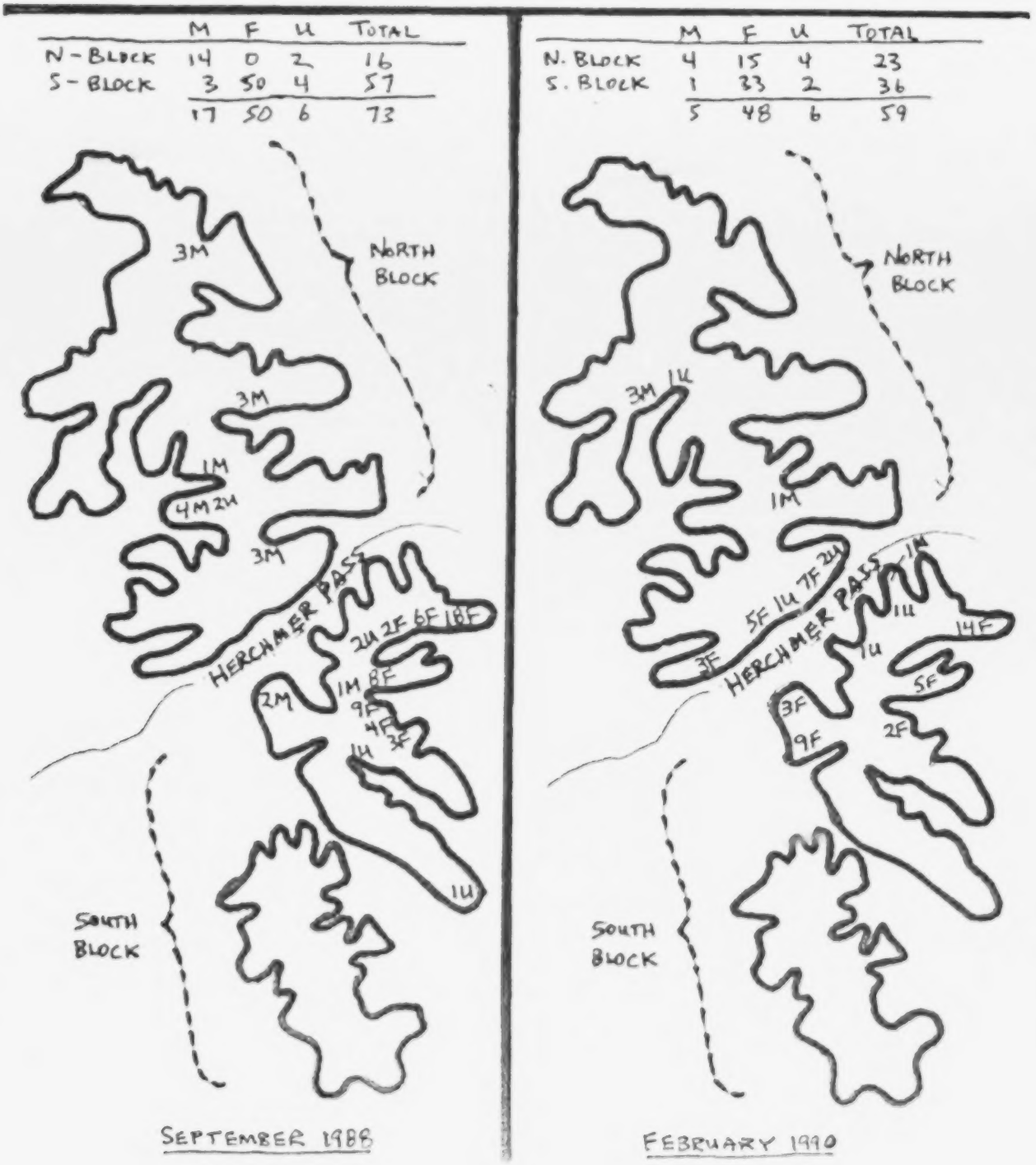
River Valley (M.U. 7-41). Sign (tracks, craters) of caribou in lowland habitats was seen only on the west fork of the Upper Ospika R. (M.U. 7-37), in a regenerating pine stand near the mouth of McGraw Creek (Russel Range, M.U. 7-40), and around Ed Bird Lake, north of Ingenika (M.U. 7-40). In addition, two antlerless males were seen in mature pine near Ed Bird Lake after the surveys, during the ferry back to the base at Mackenzie. A report from an unidentified logger at the Ingenika Camp suggested that 10-12 animals may have been present in that general area.

Elk -- Two mature bulls were seen along the Ospika River (M.U. 7-37), one in mixed forest a few km from the mouth, and one far upstream in deep snow and seemingly uncharacteristic habitat for the species. All of the remaining 25 animals observed during the surveys were in burns, on relatively open, steep, deciduous-dominated south-facing slopes. Included were 3 in the Ingenika burn (M.U. 7-40) and 22 in the upper Akie (M.U. 7-41). In addition, tracks and trails possibly made by elk were seen along some steep breaks and hoodoo topography along Pesika Creek.

Mule Deer - The only deer sightings were of 4 animals, including a doe with twin fawns, on a steep, SW-facing, aspen-dominated slope over upper Ospika Arm, and at least 5 in mixed-forest habitat high on the north-facing slope of Chowika Mountain (all M.U. 7-37).

Mountain Goat -- A total of 70 goats were observed, including 8 in the uplands between the Akie River and Pesika Creek (M.U. 7-41), 59 in scattered small groups on subalpine and alpine slopes and ridges west of the lower Ospika River (M.U. 7-37), 1 along lower Chowika Creek (7-37), and a nanny/kid pair over Rubyred Creek (7-37). The Ospika uplands were also surveyed intensively for goats in September 1988 (Hatler 1988), and it is of some interest to compare results from that flight with those obtained in the present work. As shown in Fig. 4, the 73 goats seen in the area of comparable coverage in September 1988 showed a distinctly segregated distribution relative to Herchmer Pass, with at least 14 of 16 goats seen in the block north of the pass being billies, and only 3 of 57 to the south known to be in that class. The presence of several "maternal groups" (containing 1 or more kids) north of Herchmer in February 1990, together with the reduced number of animals seen south of the pass on that flight, suggests that there may be a seasonal movement across Herchmer Pass. This may be a point of some management concern if, as is rumoured, logging plans call for a road through Herchmer Pass.

Figure 4. Comparison of mountain goat locations in uplands west of the lower Ospika River, September 1988 and February 1990. The distribution and number of goats seen are shown on the map segments; M = known males, U = adults of unknown sex, and F = members of groups in which one or more young-of-the-year were seen (i.e., "F" labels maternal groups, which may include some young males).



Stone's Sheep - Three ewes were seen together on a low ridge over the Akie River, but there was little evidence of other wintering sheep in the uplands between the Akie and Pesika Creek, and no other sheep or sign was seen elsewhere.

4.5 Other Mammals

Tracking conditions were not ideal before or during the surveys, and other mammals were relatively inconspicuous. No wolves were seen, although tracks were recorded, with minimum estimates of animals involved, as follows:

- Upper Aley Creek (7-37), 1.
- Ospika River, vicinity of Balden Creek (7-37), at least 4.
- Ospika River, goat lick area (7-37), 3-4.
- Lower Pesika Creek (7-41), at least 4.
- Upper Akie River (7-41), old trail, at least 5.
- Lower Finlay River (7-41), 2.
- Upper Finlay, between Ware and Finbow (7-40), 1.

Ingenika River, above mouth of Pelly Creek (7-40), at least 5.

Wolverine tracks were observed at several locations in the Ospika drainage, and a single large individual, certainly a male, was observed on an alpine ridge near the head of Bruin Creek. Snowshoe hare tracks were conspicuously common only on the south-facing slopes of the burn, and on Mt. Moodie, over Ospika Arm, and in wet shrub meadows north of Lafferty Arm along the reservoir. Lynx tracks were also seen in those locations, and a "tan" animal, possibly a lynx, was glimpsed on the south slope of Mt. Moodie. Beaver systems were fairly common on some of the streams draining into the east side of the reservoir, especially Bruin Creek, but were absent or at least inconspicuous in most of the primary drainages covered, especially the Ospika. Marten tracks were seen only occasionally, but conditions were not ideal for track formation by the smaller mammals.

4.6 Birds

During the goat surveys in the uplands west of the lower Ospika River, numerous Blue Grouse were flushed from what appeared to be snowbound subalpine balsam trees. Ptarmigan sign was not abundant, but a large flock of White-tailed Ptarmigan was flushed by retreating moose from a riparian willow thicket in the McCusker Creek burn. The only other bird sightings of note included a Golden Eagle near the mouth of Trident Creek, and an adult Goshawk along lower Ivor Creek.

5. HABITAT COMSIDERATIONS

Unlike the case for the southern half of the reservoir, surveyed in 1989 (Hatler 1989), most of the wildlife observed in the northern section surveyed in 1990 appear to be subsisting primarily in "natural" habitats. The primary management concerns and opportunities relate to maintenance of appropriate successional vegetation stages, especially for moose and elk. As forest operations increase in the north, the comments and suggestions relating to silviculture in Hatler (1989) will become increasingly pertinent in this area as well. It can be expected that burns in the area will become less productive as they get older, although there may be some potential for enhancement by re-burning in some of them.

Many of the low lying wetland and shrub meadow areas along the foreshore of the reservoir, especially in the Lafferty-Collins-Bruin Creeks area, showed less use by moose than their appearance gave reason to expect. The reason for that is not clear, but it may be a question of timing (more use in fall/early winter), or perhaps snow conditions were excessive in 1990, but more use occurs in other years. If useful to moose in most years, many of those areas would be subject to enhancement projects similar to those recommended for the southern half of the reservoir area (Hatler 1989).

6. RECOMMENDATIONS

In the previous report I identified the need and outstanding opportunity for research on wildlife/forestry interactions in the southern Williston area. The northern area adds another dimension, providing a reference area for pre-logging conditions, and additional habitats (particularly burns of different ages and in different environmental settings). I argue again that because management of wildlife in the reservoir area is on uplands that are remaining rather than on lowlands that are gone (and might as well be forgotten), and given the importance of forestry/wildife considerations throughout northern B.C. generally, the implied research is a legitimate if not critical component of meaningful "compensation" in the area.

7. LITERATURE CITED

Bonar, R.L. 1975. Wildlife resources and habitat in the Williston Reservoir area of North Central B.C. Unpubl. Rep., E.L.U.C. Secretariat, Victoria. 274pp.

Eastman, D.S. 1977. Habitat selection and use in winter by moose in sub-boreal forests of northcentral British Columbia and relationships to forestry. Unpubl. PhD Dissertation, Univ. British Columbia, Vancouver. 554pp.

Geist, V. 1971. Mountain sheep: A study in behaviour and evolution. Univ. Chicago Press, Chicago. 383pp.

Hatler, David F. 1988. Of mountain goats and mineral licks in the Lower Ospika Valley. Unpubl. Rep., Fletcher Challenge Canada, Mackenzie. 16pp.

Hatler, David F. 1989. Moose winter distribution and habitat use in the southern Williston Reservoir area, British Columbia, 1989. Unpubl. Rep., B.C. Ministry of Environment, Prince George. 113pp.

MOE. 1982. A resource management strategy for the Williston Basin. Unpubl. Rep., British Columbia Ministry of Environment, Prince George. 76pp.

MOE. 1983. Finlay-Omineca strategic environmental plan: technical report. Unpubl. Rep., British Columbia Ministry of Environment, Planning and Assessment Branch (Victoria) and Omineca-peace Region (Prince George). 253pp plus appendices.

MOE. 1989a. Finlay-Omineca strategic environmental plan: plan summary. British Columbia Ministry of Environment, Planning and Assessment Branch (Victoria) and Norther Region (Prince George). 67pp plus appendices.

MOE. 1989b. British Columbia Snow Survey Network: Northern British Columbia, February 1 and March 1, 1989 summaries, Water Management Branch, B.C. Ministry of Environment, Victoria.

MOE. 1990. British Columbia Snow Survey Network: Northern British Columbia, March 1, 1990 summary. Water Management Branch, B.C. Ministry of Environment, Victoria.

Sumanik, K., and A.S. Harrison. 1968. "Williston Report". Draft Rep., British Columbia Ministry of Environment, Prince George. 76pp plus appendices and correspondence.

* * * * *

FLIGHT REPORT

Purpose of Flight: To document winter distribution, aspects of abundance and population composition, and habitat status for ungulates (with emphasis on moose) in the study area.

Location: B.C. Ministry of Environment Management Units 7-37 and 7-41, and the Ingenika River area in M.U.'s 7-38, 7-39, and 7-40.

Dates: 20-25 February 1990.
Weather: Variable (see notes, by day, in following pages).

Aircraft: Bell 206 (Jet Ranger) helicopter Pilot: Larry Stewart
Observers: D. Hatler, G. Watts (all days); S. Barry (20th-22nd), R. Dawson (23rd-25th).

Species Key:

M = Moose	C = Caribou	E = Elk
SS = Stone's Sheep	MD = Mule Deer	G = Mountain Goat
W = Wolf	WV = Wolverine	BV = Beaver

0 = Other species, as designated under remarks.

Classification:
M = male; F = female; J = juvenile (young-of-the-year); Y = yearling; U = unclassified; A = unclassified adult.

Summary:

The surveys, conducted under generally good weather and visibility conditions, located a total of 564 ungulates representing six species. Included were 423 moose, of which 415 were classified to sex and age, 32 caribou, 27 elk, 9 mule deer, 70 mountain goats, and 3 Stone's sheep. In addition, one wolverine was observed and some data on wolf distribution and numbers were obtained by track counts (no wolves were seen). Detailed summaries of the survey data are presented elsewhere in this report.

For all ungulate observations recorded in following pages (and for the wolverine), summary data are given in parentheses, e.g., (3:1F,1J), where the number before the colon is the observation number, as listed in Appendix 2 and shown on accompanying maps, and the information following the colon represents sex and age of the animal(s) seen (one female with one juvenile in the example given).

Under the "location" column, full 1:50 000 NTS mapsheets are indicated as Map No. 94 x/y, while the numbers in parentheses following that designation represent the numbers of the page-sized maps compiled in Appendix 3.

Location	Species	Remarks
20 FEBRUARY 1990: -10° C, 60% CLEAR AND MOD-HIGH WINDS AT ALTITUDE; THE LAST SIGNIFICANT SNOWFALL WAS REPORTEDLY ON THE 15TH.		
MAP NO. 94 B/5 (57)		
Ospika Arm	M	One bull and one cow (1:1M,1F), in riparian habitat beside a muskeg area, at the edge of the reservoir.
Gauvreau Creek	M	Tracks in the creek bottom and at the edge of the bench to the north, but probably only a few animals involved; the general area is in thick conifer, mostly pine.
Gauvreau Creek area	M	One forkhorn bull (2:1M) in willows along the broad creek bottom of "Creek A", north of Gauvreau Crk; only a few tracks higher up that drainage.
Lower Ospika R.	E	One 5-point bull elk (3:1M) on a conifer bench just above the river, 775 m.
	M	On the river bottom flats north of the elk, ungulate tracks (all or mostly moose) are fairly common in the open, mixed spruce/aspen forest, but none seen.
MAP NO. 94 B/5 (55.56)		
Creek "B"		This is in thick conifer, and includes a fairly deep canyon at the lower end; no tracks seen in the portion covered.
Creek "C"	M W	Only a few old tracks seen; Trapper Jarl Sundve, encountered there, reported that there has been one wolf in this area, but he had not seen many moose or much fresh sign in the lowlands (Note: loggers at Ospika camp reported seeing a large black wolf in that general area); snowdepth in a shrub meadow 62,60,55--possibly down to overflow rather than true bottom.
N. of Creek "C"	M	One cow (4:1F) on a low, pine/aspen knoll just up from the river (725 m); no tracks seen in the muskeg to the east.
Creek "C" burn	M	Burned south and west-facing slope, with fairly thick second growth pine and willow, several moose seen, as follows: one bull (5:1M) at 875 m; a cow/calf pair (6:1F,1J) at 850 m; a single cow (7:1F) at 1050 m, a bull (8:1M) at 1025 m, a cow (9:1F) at 975 m, and a bull (10:1M) at 1100 m; no tracks seen in a pass along the 1200 m level.

Location	Species	Remarks
Ospika River	M	The floodplain and adjacent flatland forests appear to be mostly under deep snow; no fresh tracks up to the lower section (both branches) of Creek D, or Aley Crk.
Creek "E"	M	There is a patch of riverside cottonwood at the mouth, with big willow in the understory, but with deep snow and only a few old tracks.
Upper Aley Creek	M WV W	A few scattered tracks, suggesting 1 or 2 moose that are mostly using riparian shrubs; also tracks of a wolverine and an apparent lone wolf.
		Into the uplands south of Aley Creek; they are snowbound; also, weather and visibility marginal, so back down to lowlands.
MAP NO. 94 B/12 (48)		
N. of Creek "E"	M	Scattered tracks, mostly old, along the river to the north; most fresh tracks are "travel tracks" along the river ice.
Creek "F"	M	Fresh tracks at the mouth and up to 2km upstream both along the creek and on the bench just to the north (perhaps 2-3 individuals).
	M	Upstream from Creek "F" to Balden Creek is mostly rolling uplands in thick conifer; a few tracks seen here and there, but an intensive search is not practical.
N. of Balden Crk	M W	Still a few fresh moose tracks on the river, and a wolf trail (minimum of 4 animals) is also present.
Lower Ospika R.	M	Back down along the west side of the river; as on the east side of the valley, occasional tracks seen in riverside meadows and uplands, but not indicating high numbers.
Creek "H"	M WV	Burn with good looking 2nd growth and shrub cover, and a few fresh and several old tracks seen; there are more old tracks, suggesting heavier use prior to the last snow; one set of wolverine tracks (fresh) on the steep slope above the creek.
MAP NO. 94 B/5 (55)		
Goat Lick area	W M F	A wolf trail (3-4 animals) along the river; there were several fresh moose tracks (1-2 animals?) at the lower end of the creek behind the lick; also, a set of otter tracks there.

Location	Species	Remarks
Lower Ospika R.	M	Only scattered tracks from the lick to the lower end of the river, mostly on riparian bars and in adjacent timber, but no animals seen; also fair numbers of fresh and old tracks in the east-facing burn in that area.
MAP NO. 94 B/5 (57)		
Upper Ospika Arm	M	Several sightings in this aspen-dominated, south-facing burn, as follows: one cow and calf (11:1F,1J) at 975 m; one bull (12:1M) at 1000 m; two bulls and one cow (13:2M,1F) at 900 m; two cows (14:2F) at 800 m; one bull (15:1M) at 800 m, and two cows (16:2F) at the base of the slope (750 m).
	F	There is also abundant hare sign along this slope--the first significant amount we've seen, and 1 lynx track seen across an opening along the lower river floodplain just to the north.
	M	A higher pass, at about 1100 m, found no animals and considerably fewer fresh tracks.
MAP MO. 94 C/8 (54)		
Creek "I"	M	Still in the burn, and with good-looking cover; tracks common to 950 m, and a few as high as 1150 m, but no animals seen.
Ospika Arm	M	Lower on the south-facing slope, overlooking the Arm, more moose seen: one cow (17:1F) at 775 m; one bull (18:1M) at 750 m and another (19:1M) at 875 m; one cow (20:1F) at 875 m.
	M	On the pine flats down by the forestry road, more moose: one forkhorn bull (21:1M) at 725 m; one cow (22:1F) and two bulls (23:2M) below the road at 700 m.
	M	More sightings on the bench just above the reservoir (pine/aspen cover): single cows (24:1F; 25:1F) at 700 m.
	M	One cow (26:1F) in mixed forest above the road, at the base of the hill (775 m).
N. of Ospika Camp	M	The forest cover in the big flats north and east of camp consists of large pine, fairly open and mixed with aspen both in patches and as scattered stems; there are tracks fairly well throughout.
	M	One bull (27:1M) low on the south-facing slope, at the edge of aspen dominated cover (800 m).

Location	Species	Remarks
Camp area	M	One bull (28:1M) on the high bench at the edge of Ospika Arm, at 725 m, then a forkhorn (29:1M) in pine flats to the north (750 m).
	M	One bull (30:1M) low on the S-facing aspen slope (775 m).
	MD	A doe with 2 fawns and a single adult nearby, (31:1F,2J,1A) on the aspen slope at 825 m.
	M	Two cow/calf pairs, not together (32:1F,1J; 33:1F,1J) in aspen at 950 m.
DOWN FOR LUNCH AND FUEL		
N. of camp	M	Two bulls (34:2M) at 1025 m, near the upper edge of the aspen slope.
	M	One bull (35:1M) at 1225 m, same slope; few tracks at this level.
Uplands, Creek "I"	M	Working north for alpine surveys; only old moose tracks present in the high burn along the upper east fork of Creek "I".
MAP NO. 94 C/8 (52)		
	0	First subalpine/alpine block to the north; two Blue Grouse flushed from snowbound balsam clumps at 1775 m.
Upper Lafferty Creek	C	One cow and calf caribou (36:1F,1J) on a windblown ridge at the headwaters, 1800 m.
	C	Five adult caribou (37:5A) on the ridge west of the Ospika Goat Lick, at 1800 m.
MAP MO. 94 C/9 (45)		
S. of Herchmer Pass	G	Several groups of goats seen in uplands south of the pass, over drainages to the Ospika Valley: one nanny and kid (38:1F,1J), alone in a small, north-facing basin (1550 m), with the only tracks leading to some small balsam clumps downslope; minimum of five (39:5U) crammed under ledges at 1700 m on a south-facing slope (5 Blue Grouse flushed from high balsam just east of the goats); fourteen, including at least 2 kids (40:2J,12U) in caves and under ledges high on the S-facing slope (1750 m).
Herchmer Pass	G	One single, an apparent billy (41:1M) on a rocky point facing north over Herchmer Creek, at 1500 m, then another single (42:1A) just around the corner at 1550 m..
	G	One adult (43:1A) seen crossing a high basin (1650 m) on the south side of Herchmer Pass--

Location	Species	Remarks
Herchmer Pass area		tracks there, including trails wandering among balsam at 1500 m suggested there were more in the area.
	G	Nine, including at least 2 kids (44:2J,7U), on a west-facing, rocky slope south of the Pass, at 1750 m.
	G	One nanny and kid (45:1F,1J) on the NW slope over Herchmer Pass, 1650 m.
MAP NO. 94 C/9 (44)		
N. of Herchmer Pass	G	One nanny and kid with an unclassified adult (46:1F,1J,1A) on the south-facing point over Herchmer Pass, Collins Creek drainage, 1650 m.
MAP NO. 94 C/9 (45)		
	G	Nanny with two kids, and a nanny/yearling pair (47:2F,2J,1Y) on a south-facing point to the east over the Pass, at about 1700 m.
	G	Several scattered along the SE-facing slope immediately facing the Pass: one adult (48:1A), 1750 m; seven, including at least two kids (49:2J,5U), 1700 m; one adult (50:1A), at 1750 m, then another (51:1A) near the end of the ridge, 1800 m.
MAP NO. 94 C/9 (44)		
Bruin Creek	WV	Large wolverine (52:1A), almost certainly a male, seen on an alpine ridge, 1800 m, at the headwaters.
	G	One large billy (53:1M), on a rocky slope at 1600 m, near the south fork headwaters.
	0	Over the past hour we have seen several more Blue Grouse—all at about 1700-1750 m, in balsam, and usually as singles.
MAP NO. 94 C/9 (41)		
Bruin Creek	G	Three billies (54:3M), at 1600 m over the headwaters middle fork.
	G	One adult (55:1A), east of the billies, 1650 m.
MAP NO. 94 C/9 (44)		
	M BV	Through the burn in upper Bruin Creek; there are few tracks, mostly old; there are some extensive beaver systems along stretches of this creek.
Upper Collins Creek	M	One cow and calf moose (56:1F,1J), seen in passing on a mixed-forest knoll, 975 m.
MAP MO. 94 C/8 (53)		
N. of Tobin Lake	M	Another cow and calf (57:1F,1J) seen in passing, on a sparsely forested knoll (1000 m).

Location	Species	Remarks
MAP NO. 94 C/8 (54)		
Camp area	M	One bull (58:1M), seen from the ground beside the Ospika camp airstrip, 700 m.
21 FEBRUARY 1990: -2° C; VERY WINDY/BLUSTERY, WITH 100%, HIGH CLOUD COVER (ABOUT 2150 m)		
Camp area	M	Starting at the "creek" through the forest flats north of camp; fresh tracks seen at several locations in the pine/aspen woods, but there is probably not a high density of animals.
Tobin Meadow	M	One bull (59:1M) at the south edge of the shrub meadow south of Tobin Lake, 725 m; there is abundant willow here, with patches of open, mixed spruce/aspen, surrounded by thick pine.
	M	Two bulls (60:2M) in thick spruce-muskeg with willows fairly common, 725 m.
	M	One bull (61:1M), still in the meadow, 750 m.
	M	Two bulls (62:2M), one cow/calf pair (63:1F,1J), and a lone cow (64:1F), all in a patch of thick, high willows near the SE end of the lake, 725 m.
	M	One cow (65:1F) near the south end of the lake, 725 m.
Creek "J"	M	One bull (66:1M) in riparian willow along the creek, at 750 m, then two bulls (67:2M) on the bench east above the creek, 800 m.
	M	Farther upstream, one bull (68:1M) on the bench along the creek (850 m); there are tracks in the burn upslope to the west, but no animals were seen there.
Tobin Lake	M	One cow (69:1F) seen in low aspen (750 m) north of the lake.
MAP NO. 94 C/8 (51)		
Lafferty Creek	M	Single bulls (70:1M; 71:1M) seen in the creek bottom, upper east fork, 800 m; only a few tracks upstream from there and none after the creek bottom level reaches 925 m.
MAP NO. 94 C/9 (45.42)		
Herchmer Pass		No tracks in the heavily wooded bottomland through the Pass; the snow looks very deep.
Upper Ospika R.	M W	Only a few tracks along the river within 3-4 km upstream of Herchmer Crk.; the wolf trail (still looks like 3-4 animals) is present here.

Location	Species	Remarks
	0	One Golden Eagle seen in the river bottom, below the Trident Peak block.
MAP MO. 94 B/12 (46)		
Trident Peak area	M	In the burn at the mouth of "Trident Creek", there are tracks, mostly below 950 m, but no animals seen (22nd, two unclassified adults seen in passing, bedded down near the mouth of the creek (72:2A), 900 m.
	M	One large bull (73:1M) in deep snow at the base of the east slope, 850 m.
MAP NO. 94 C/9 (42)		
Trident Peak area	M	One large bull (74:1M), on the west-facing slope over the river, at the edge of the burn, 850 m.
	M	Several animals seen on the rolling breaks in the burn east of the river, as follows: Three cows and one bull (75:1M,3F) at 850 m; One bull (76:1M) at 900 m; One cow and calf (77:1F,1J) at 925 m; and two cows (78:2F) at 900 m.
MAP MO. 94 B/12 (46)		
Upper Ospika burn	M	More sightings north of the above, as follows: Three bulls and one cow (79:3M,1F), at 975 m, one bull (80:1M) at 925 m, and one bull (81:1M) at 1025 m.
MAP NO. 94 C/9 (42)		
Upper Ospika burn	M	Across the river (west side), on lowland flats in the same burn: one bull (82:1M) at 875 m, one bull (83:1M) at 875 m, and one bull (84:1M) near the river at 850 m.
MAP NO. 94 C/16 (33)		
Upper Ospika burn	M	Back to the east side of the river, in rolling uplands south of lower McCusker Creek: enroute—one cow and calf (85:1F,1J) in riparian shrub beside the river, 850 m.
	M	Sightings in the burn south of lower McCusker Creek: one cow and calf (86:1F,1J) at 900 m, then another cow and calf (87:1F,1J) at 925 m, two bulls (88:2M) at 925 m, one cow (89:1F) in a gully beyond the bulls (900 m), two bulls (90:2M) at 1000 m, and one cow (91:1F) along a low ridge over McCusker Crk, 900 m.
MAP NO. 94 B/13 (34)		
McCusker Creek	M	Several moose seen in the burn along the first major tributary of McCusker Creek ("Trib A"), as follows: two bulls (92:2M) high (1100 m) on the south ridge; one cow (93:1F) farther out that ridge (1125 m); one small bull with one antler (94:1M) in chest-deep snow on the steep sidehill, at 1075 m.

Location	Species	Remarks
Mccusker Creek area ("Trib. A")	M	In the creek bottom, only scattered tracks (mostly old) from the 1075 m contour on up; several moose seen along the creek on the way down, as follows: two bulls and two cows (95:2M,2F) at 1050 m; one bull (96:1M) on the south-facing sidehill, at 1100 m; two bulls (97:2M) at 1025 m; four bulls (98:4M) at 1000 m; one cow and calf (99:1F,1J) at 975 m; two bulls (100:2M) on the sidehill at 1025 m; two more (101:2M) higher on the sidehill (1100 m); one cow (102:1F) in the creek bottom at 1000 m; two bulls (103:2M) in the creek
	O	bottom at 975 m (25+ White-tailed Ptarmigan flushed by the above bulls); one cow (104:1F) low on the sidehill (1000 m); and one bull (105:1M) at the mouth of the creek, 900 m.
McCusker Creek	M	Higher on the south-facing slope over "Trib. A", one cow (106:1F) at 1050 m, then one bull (107:1M) at 1125 m.
	M	More moose on the west-facing slope over Mccusker Creek, between "Trib. A" and Denkman Creek: two bulls (108:2M) at 1225 m and one cow (109:1F) at 1150 m.
Denkman Creek	M	There are tracks in the valley bottom up to about 1025 m; sightings on the way back down the creek as follows: one cow (110:1F) on the south-facing slope at 1100 m, one bull (111:1M) in a side canyon at 1050 m, one bull (112:1M) in the creek bottom at 1000 m, and one bull (113:1M) in riparian shrub along the lower creek.
Upper McCusker Creek		The burn doesn't extend much above the canyon, which is just upstream of the mouth of Denkman Creek; the creek bottom upstream appears to be primarily in conifer cover and under deep snow; few tracks.
McCusker Creek		Working back down the west side of the creek, back in the burn; numbers of moose seen, as follows: Two bulls (114:2M) at 950 m on the slope and one cow (115:1F) in the creek bottom (925 m)—all across the creek from the mouth of Denkman Creek.
	M	One bull (116:1M) in a riparian meadow along the creek, and another (117:1M) bedded down on the ice of the creek (925 m).

Location	Species	Remarks
MAP NO. 94 C/16 (33)		
Lower Mccusker Creek	M	Continuing in the burn along the S-facing side of the valley: one bull (118:1M) on a low bench at 1000 m.
	M	Two bulls (119:2M), in riparian shrub (925 m).
	M	One bull (120:1M) higher on the slope (1000 m).
	M	Two bulls (121:1M) just up from the east side of the creek (925 m).
	M	One bull and one cow (122:1M,1F) on an upper bench at 975 m, then a cow and calf (123:1F,1J) at 1025 m, all upslope from the mouth of Mccusker Crk.
	M	One cow (124:1F) at 1075 m, then two bulls (125:2M) at 1100 m (one of those looking thin and in poor condition), and then another cow (126:1F) downslope nearby (1050 m).
END OF MORNING SURVEYS		
MAP NO. 94 C/1 (59)		
Ospika Camp area	M	On the flats around camp (mostly large pine, but with aspen and spruce mixed in), tracks are common, but sightability is low and probably the number of animals present is not high.
Mt. Moodie (South)		Working on the south end, facing Ospika Arm.
	M	Four bulls together (127:4M) at about 750 m, and one cow (128:1F) farther downslope (700 m), all in predominantly deciduous cover—mostly aspen, but with some birch mixed in.
	M	Moose tracks are common at the 750 m level all around the south end of the mountain.
	M	One cow and calf (129:1F,1J) at 1000 m.
S. Mt. Moodie	M	Another cow and calf (130:1F,1J) lower downslope, to the west (775 M).
	F	Snowshoe hare tracks are numerous at all levels here, and a "tan animal"—coyote/lynx size--was glimpsed briefly at about 950 m.
	M	One bull with 3 point antlers (131:1M) seen in thick balsam downslope (750 m).
MAP NO. 94 C/8 (53)		
Mt. Moodie (SW)	M	Bull with one antler—4-5 point "paddle" (132:1M) in thick aspen, 750 m.

Location	Species	Remarks
Mt. Moodie (SW)	M	Three bulls together (133:3M) at about 725 m, and a cow/calf pair (134:1F,1J) just upslope at 775 m; all in open aspen habitat.
	M	One bull (135:1M) in aspen cover at 800 m, then a bull (136:1M) and a cow (137:1F) higher in the same habitat (900 m).
N. of Carrier Point	M	Cow with two calves (138:1F,2J), in aspen cover well away from the shore at 800 m.
	M	One bull (139:1M) lower on the same slope, at 725 m.
	M	Lone cow (140:1F) in low aspen near the reservoir, 700 m.
	M	One bull (141:1M), just north of the creek draining the MW end of Mt. Moodie, and near the mouth, 700 m.
Lafferty Arm area		Habitat change, to mostly thick pine, but with some large stands of aspen and with good riparian shrub patches scattered throughout, especially just up from the reservoir.
	BV	The first creek south of Lafferty Arm has several beaver dams along its lower extent;
	M	moose tracks present, but no animals seen.
Lafferty Crk	M	Cow and calf (142:1F,1J) on a low bench (pine and aspen), 750 m, along the lower south fork.
Tobin Lake	M	Lone cow, apparently pawing for slush out on the north end of the lake (143:1F), 725 m.
Lafferty Creek	M	One bull (144:1M) in open deciduous cover above the creek, at the junction north of Tobin Lake, 750 m.
	M	Cow and calf (145:1F,1J) on the deciduous slope just west of the above junction, 850 m.
	M	Abundant tracks along the S-facing aspen slope over Lafferty Crk, but no more animals seen.
MAP NO. 94 C/8 (50)		
N. Lafferty Arm	F	Hare tracks common and one set of lynx tracks seen in the wet shrub meadows near the reservoir (700 m), mid-way between Lafferty
	M	and Collins Arms; only old moose tracks there.
Collins Arm area	BV	Several beaver dams and ponds along the lower
	M	reaches of "Creek J"; a few fresh moose tracks also present there, but no animals seen.

Location	Species	Remarks
Collins Arm area	M	Cutblocks south of Collins Bay: A few fresh tracks in all 4 (A-D), but no animals seen.
	M	Cutblocks north of Collins Bay: Tracks in all and animals seen, as follows: one cow (146:1F) and one bull (147:1M) in sparse residual timber at the edge of "E"; one cow (148:1F) along a ravine at the north edge of "E", one bull (149:1M) in "F", two cows (150:2F) near the lower end of "G", one cow and one bull (151:1F,1M) in timber below "I", and one cow (152:1F) in "K"; all at about 725 m.
Bruin Creek	M	Two bulls (153:2M) along the creek, 750 m.
MAP NO. 94 C/9 (43)		
N. of Bruin Creek	M	One bull and one unclassified adult (154:1M,1A) found in thick pine/aspen cover at 850 m.
Davis Creek	M	Both fresh and old tracks in three cutblocks south of the creek, but no animals seen.
	M	One cow/calf pair (155:1F,1J) and two bulls (156:2M) seen low in the burn (800 m) facing south over lower Davis Creek.
MAP NO. 94 C/9 (40)		
	M	Despite the presence of what looks like good riparian habitat in a broad valley bottom, few tracks seen upstream of the burn; finally, two bulls (157:2M) seen chest-deep in snow on the south-facing edge of a bench at the forks.
	M	Back downstream in the burn along the W-facing side of the creek; probably good early winter habitat, but snow depth is probably limiting now and no tracks seen.
MAP NO. 94 C/9 (43)		
	M	A few tracks, mostly old up to 1150 m in the S-facing burn, but no more animals seen.
N. of Davis Creek	M	A cow and calf (158:1F,1J) seen in timber at the edge of a cutblock, 750 m.
MAP NO. 94 C/10 (39)		
N. of Davis Crk.	M	One large bull (159:1M) in cutblock "E" north of the creek, 800 m.
Shovel Creek	M	A few tracks along the creek in the cutblock along the lower end.
MAP NO. 94 C/10 (38)		
	M	There are tracks in most of the cutblocks to the north, and in lowland shrub meadows, but most appear to be old.

END OF DAY AT HORN CREEK

Location	Species	Remarks
22 FEBRUARY 1990: WARMED UP CONSIDERABLY OVERNIGHT; TEMPERATURE AT GROUND LEVEL IS 0° C; HIGH OVERCAST (2000-2200 m), WITH STRONG, GUSTY WINDS MOST OF THE DAY.		
MAP NO. 94 C/9 (42)		
Trident Peak	G	An attempt to survey the alpine areas in this mountain block had to be aborted because of the high winds; only a few summer trails seen in the area covered.
MAP NO. 94 C/16 (33)		
Upper Ospika R.	M	In the burn along the Ospika Valley north of Mccusker Creek, only old tracks seen and those along the river.
	WV	Wolverine tracks along the river.
	M	One small cow (160:1F) at the edge of a low mixed-forest bench above the river, 900 m.
	W	Old wolf trail, on the river just north of the last moose location.
MAP NO. 94 C/16 (32)		
Upper Ospika R.	E	One 6-point bull elk (161:1M) bedded down on the river ice; tracks indicated it had been working an area of about 1 km along the river, and not venturing far from it; deep snow here.
MAP NO. 94 F/1 (21)		
	WV	The only tracks along the river for a considerable distance are of a wolverine.
MAP NO. 94 F/1 (19)		
Upper Ospika R.	M	Just below the upper fork, one adult (162:1A) so deep in snow that its rear end could not be observed, 1050 m.
MAP NO. 94 F/1 (20)		
	F	A few marten tracks and one or more porcupine tracks at the headwaters junction, and along the east fork, but no ungulate tracks seen.
MAP NO. 94 F/1 (19)		
	M	Along the west fork, one old moose track appearing as a furrow from chest drag, perhaps made in the recent past by the animal of observation #162.
	C	Other than a few marten tracks, the only other sign along the west fork was an area of cratering, suggestive of caribou, among balsam near the junction.
MAP NO. 94 F/1 (21)		
		Snowdepth in a meadow beside the river, just below the mineral springs, was 133 cm (mean of three probes).
MAP NO. 94 C/16 (32,31)		
	M	One cow (163:1F) in very deep snow on a steep bank at the edge of an avalanche chute,

Location	Species	Remarks
Upper Ospika R.		1050 m; she was missed on the first (upriver) pass along this section, since the only tracks were in thick balsam.
Chowika Creek		Ferried through a high mountain pass to the headwaters area; deep snow and no tracks enroute, and along most of the upper north fork.
MAP NO. 94 C/15 (30)		
Chowika Creek	M	A few tracks above the first major fork, and two animals finally seen in thick timber by an exposed knoll just above the fork, 850 m, (164:1M,1A); only old tracks from there downstream.
MAP NO. 94 C/15 (29)		
	G MD	One goat seen on a low cliff over the creek, (165:1A), and then a minimum of five deer (166:5U) glimpsed in thick timber on the steep rocky slope opposite, at about 1000 m, as we circled for another look at the goat.
MAP MO. 94 C/10 (37)		
	O	Six horses seen in the high cutblock just south of the creek, near the mouth.
Chowika Bay area	M	One cow (167:1F) seen in thick second growth of an old burn at 700 m.
	M	One cow and calf (168:1F,1J) in a section of the burn dominated by fairly large aspen, just south of the bay, 700 m.
	M	One cow and calf (169:1F,1J) on a low, mixed-forest knoll below a cutblock, 725 m.
MAP NO. 94 C/10 (38)		
Horn Creek	M	One cow (170:1F) in timber at the edge of a cutblock just north of the creek; tracks are common throughout this area.
END OF MORNING SURVEYS		
MAP NO. 94 B/5 (57.58,56)		
Gauvreau Creek	C	Commencing reconnaissance of uplands east of the Ospika River; goat tracks seen along S-facing ridges and cliffs at several locations over Gauvreau, and one adult seen (171:1A); tracks also seen in high balsam (1675 m) away from cliffs, at the west end of the ridge.
Eastern Uplands		Continued east along the ridge to Gauvreau Peak; these uplands are mostly snowbound and no more tracks seen.
MAP NO. 94 B/12 (49.47.46		
Mt. Lady Laurier		Northward, paralleling the height-of-land at high elevation to Mt. L. L., then around the mountain; again, this area is mostly snowbound

Location	Species	Remarks
		and no evidence of wintering ungulates seen;
	WV	the only track was of a wolverine, across the south side.
Upper Balden Crk		Along a ridge west of the creek; snowbound, with no tracks.
MAP NO. 94 C/9 (42)		
Trident Peak		Another attempt to survey uplands scuttled by the extreme gusty winds in this area; returned to Ospika Camp area.
NO. 94 C/8 (54)		
Ospika airstrip	W	Tracks of 3-4 animals seen along the reservoir east of camp headed upslope and came out to the airstrip; identification confirmed from the ground.

END OF DAY

23 FEBRUARY 1990: HIGH, THIN OVERCAST AND COOLER (-10° C AT GROUND LEVEL), AND STILL WINDY, BUT NOT AS STRONG AS ON THE 22ND; A FEW SNOW SQUALLS IN PM.

MAP NO. 94 C/8 (53)		
Tobin Lake area	M	One adult (172:1A) seen in passing at 925 m, on the burned slope west of the lake (an area not covered in previous flights).
MAP NO. 94 C/8 (50)		
S. of Collins Bay	M	Single adult (173:1A) in an opening near Creek "J"—tracks, but no animals had been seen there on a previous flight.
Collins Bay area	M	Three more moose not seen previously—all antlered bulls (174:3M) at the edge of cutblock "C"; there were two medium bulls (antler spread about 90-100 cm) and one small (single 3-point antler).
MAP NO. 94 C/15 (29)		
Chowika area		Starting "official" survey on the S-facing aspen slope between Chowika and Police Creeks; old
	M	tracks seen as high as 1150 m; one bull (175:1M) and one cow (176:1F) seen at 900 m.
	M	Cow and calf (177:1F,1J) seen in a small patch of pine low on an otherwise mostly aspen slope, 725 m.
Police Creek area	M	Two bulls (178:2M) in a large aspen patch NW of Police Crk Meadow, 675 m; 10+ horses seen in the meadow; the forested lowlands here are mostly in pine or aspen patches, but with some areas of mixed forest as well.
	M	One cow and calf (179:1F,1J) in a mixed forest patch at 775 m.

Location	Species	Remarks
Police Creek burn	M	One cow and calf (180:1F,1J) and a single cow (181:1F) seen in a pass at 925 m; farther upstream, three bulls (182:3M) on a low bench just above the creek (900 m).
Upper Police Creek	M	A few fresh and numerous old tracks present in the valley bottom as far upstream as the height-of-land between Police Creek and a fork of the Chowika.
	M	A cow with two calves (183:1F,2J) seen on the south-facing burned slope at 1175 m, in a thick little patch of second growth pine; a few other tracks farther west along the slope at that level, and one set of very fresh ones in a creek gully at 1325 m.
	M	One pass along the 1050 m level along the N-facing side of Police Creek (also burned); a few scattered tracks, mostly old.
	BV	There are beaver dams and ponds near the headwaters of Police Creek.
NO. 94 C/15 (28)		
Ivor Creek area	M	Cow and calf (184:1F,1J) in aspen at 975 m.
	M	One bull (185:1M) in an aspen patch out in the flatlands near Van Somer Point, 675 m.
	M	Cow and calf (186:1F,1J) in an aspen patch just above the reservoir, 675 m.
	M	Another cow and calf (187:1F,1J) farther upslope (700 m) in the same aspen patch.
	O	One adult Goshawk seen flying along lower Ivor Creek.
MAP NO. 94 C/15 (27)		
Rubyred Creek area	M	One bull (188:1M) at 1050 m, and another bull (189:1M) at 975 m, SW-facing aspen slope south of the creek; there were also a few fresh tracks at 1225 m.
Rubyred Creek	G	One nanny and kid (190:1F,1J) in a rocky gully along the south fork.
Finlay River	M	Tracks fairly common along the lower west-facing slope along the river, but the mixed forest cover is fairly thick and sightability is low.
	M	One cow (191:1F) at 925 m, and then a bull (192:1M) at 900 m, both in mixed pine/aspen cover; a few fresh tracks seen in a pass along the 1200 m level.

Location	Species	Remarks
DOWN TO INGENIKA CAMP FOR FUEL AND LUNCH		
MAP NO. 94 C/14 (25)		
Pesika Creek	M	One bull (193:1M) at 825 m, on an aspen ridge.
MAP NO. 94 F/3 (13)		
Pesika Creek	M	One bull (194:1M) at 800 m, then a cow and calf (195:1F,1J) at 775 m, all in S-facing aspen.
MAP NO. 94 F/2 (17)		
Pesika Creek	W	A fresh wolf trail along the river breaks off to a minimum of 4 animals.
MAP MO. 94 F/2 (18)		
Pesika Creek	M	Working up the north-facing side of the valley, there are scattered tracks to where the valley bottom is at about 900 m, but no more animals seen to that point.
	M	Working back down the south-facing side; two bulls (196:2M) seen in thick spruce/aspen along a series of slides, 975 m; tracks generally more common on this exposure, but the conifer cover is fairly thick and sightability is poor.
MAP NO. 94 F/2 (17)		
	M?	Tracks and trails fairly common along steep breaks and hoodoo areas—may be either moose or elk; none of either seen.
MAP NO. 94 F/3 (13)		
Lower Pesika Creek	M	One bull (197:1M) in deciduous cover (mixed birch and aspen) at 850 m.
	M	Two bulls (198:2M) in aspen at 925 m.
MAP NO. 94 F/2 (17)		
Lower Pesika Creek	M	One cow and calf (199:1F,1J) seen along a steep gully, at 1075 m.
MAP NO. 94 F/3 (13)		
Lower Pesika Creek	M	One bull (200:1M) at 1025 m, and another bull (201:1M) at 1050 m, both in an aspen patch surrounded by spruce and pine.
	M	Two bulls (202:2M) in thick, second-growth pine on the flats at the base of the hill, 675 m.
MAP NO. 94 C/14 (25)		
Lower Pesika Creek	M	One bull (203:1M) in a low aspen patch, 675 m.
MAP NO. 94 F/3 (13)		
N. of Pesika Creek	M	Around corner to the north, one cow (204:1F) high on an aspen slope, 1075 m.
Akie River	M	One cow and one bull (205:1F,1M) in riparian cottonwood/spruce, 700 m.

Location	Species	Remarks
Akie River		Working the north-facing side of the valley; the lower section is a large burn, and tracks are common although relatively few animals seen.
MAP NO. 94 F/2 (17)		
Akie River	M	A few tracks to 950 m on the S-facing side of the first major tributary from the south ("Trib. A").
	M	Finally, one bull (206:1M) seen on a burned slope at 975 m.
MAP NO. 94 F/2 (14)		
	M	Tracks well upstream on "Trib. B"; one bull (207:1M) seen on the S-facing slope there, at 1000 m.
	M	Four bulls (208:4M) in the creek bottom of "Trib. B", 900 m.
mid-Akie R.	M	Several moose seen on the burned SW-facing slope just north of the confluence with "Trib. B", as follows: two bulls (209:2M) at 850 m; two bulls (210:2M) together and then a single bull (211:1M) at 1150 m; cow and calf (212:1F,1J) at 1125 m; two bulls (213:2M) at 950 m.
	M	One bull (214:1M) in riparian habitat, bedded down on the ice of an oxbow, 775 m; the snowdepth in a meadow nearby was 80 cm.
	M	One bull and two cows (215:1M,2F) in riparian shrub beside the river, 775 m.
	M	Four moose, more or less together on a shrub and sapling-covered fan beside "Trib. C", two bulls and two cows (216:2M,2F), 800 m.
	M	One bull (217:1M), same area; there is a fair amount of second-growth spruce coming up under the deciduous cover here.
Akie River		Continuing north from "Trib. C", out of the burn and back into fairly thick conifer cover.
MAP NO. 94 F/7 (5		
Akie River	M	One bull (218:1M) in riverside riparian habitat, 775 m.
	M	One bull (219:1M) in riparian willow at the mouth of "Trib D"; this is the beginning of the big bend in the river, where it swings around from the east.
Upper Akie R.	M W	Relatively few moose tracks above the bend for some distance; there is an old wolf trail

Location	Species	Remarks
Upper Akie R.		along the river edge, but no indication of numbers.
MAP NO. 94 F/7 (6)	M	One bull (220:1M), in riparian habitat along the river, 825 m.
	M	One cow (221:1M), bedded on the river, 850 m.
	W	The wolf trail seen upstream again (made before the last snow-minimum of three animals); we turned at the outfitter's cabins, and headed back downstream on the N. side of the valley.
NO. 94 F/7 (5)	M	Only scattered tracks along the lower slope, above the river, all the way back to the big bend; two bulls (222:2M) seen in riparian shrub across the river from "Trib. D", 800 m.
MAP MO. 94 F/2 (14) Akie River	M	Two bulls and one cow (223:2M,1F), high in the riparian willow of a creek gully (950 m), and in chest-deep snow there.
	M	One cow (224:1F) in riparian spruce/willow just up from the river, 750 m.
	M	Back into the burn, and several moose seen on the S-facing slope, as follows: three bulls (225:3M) and then a single bull (226:1M), all at 1050 m; one bull (227:1M) at 1100 m.
NO. 94 F/3 (13) Lower Akie R.	M	Farther south, one cow and calf (228:1F,1J) at 925 m.
	M	Three bulls (229:3M), one with one two-point antler, in spruce/aspen at the south end of the Truncate Range, 900 m.
END OF DAY		

24 FEBRUARY 1990: HIGH OVERCAST (2100 m), WITH A FEW SMALL BREAKS TO THE BLUE; STILL WARM (-2° C IN AM), WITH MODERATE WINDS.

MAP NO. 94 C/14 (25) Lower Finlay R.	M	Two cows (230:2F) in lowland aspen, 675 m.
	W	Fresh tracks of two wolves along an open lead on the lower river.
MAP NO. 94 F/3 (13) Lower Akie R.	M	One bull (231:1M), in riparian habitat about 2 km up from the mouth, 650 m; the lowlands north of the lower Akie are in mostly thick conifer, both pine and spruce, with a few spruce bogs showing occasional tracks.

Location	Species	Remarks
Lower Finlay R.	M	Abundant tracks on oxbows and islands, but most of the animals are apparently up in the adjacent timber; finally, three antlered bulls (232:3M) seen in floodplain cottonwood/willow at 650 m; one bull with 90-100 cm antler spread, one with a single antler of about the same size, and a single-antlered paddle bull.
	M	One cow with a large calf (233:1F,1J) back on a cottonwood island just to the south, 650 m.
	M	One cow and calf (234:1F,1J), then two cows (235:2F), then one bull (236:1M), all in riparian cottonwood, 675 m.
MAP NO. 94 F/3 (12,11) Finlay R.	M	Tracks common to abundant along the shore and on islands all the way up to and including the mouth and lower reaches of Del Creek, but no animals seen in that section; the upland cover in this area is mostly thick pine.
Del Creek area	M	One paddle bull with one antler (237:1M) in open spruce on a bench above a hoodoo bank along the river, 750 m.
Finbow area		The snowdepth on an open, riparian sapling bench beside the river, is just 42 cm; there appears to be even less in adjacent timber.
Del Creek	M	Three bulls (238:3M), including one with a fork antler, at 900 m on the burn aspen, S-facing slope of Mt. Del.
MAP NO. 94 F/6 (4) Mt. Del	M	Cow with two calves (239:1F,2J) in aspen at 1025 m at the MW end of the mountain; tracks common all along the W-facing slope at that level.
MAP NO. 94 F/3 (11) Mt. Del	M	A few tracks and one bull (240:1M) seen higher on the slope, south end, at 1350 m.
MAP NO. 94 F/6 (4) Grave Mountain	M	Long, gently sloping, SW-facing burn with abundant deciduous sapling cover–birch/aspen mix; tracks common to 1300 m on the south end, and several animals seen high on the slope as follows: one cow and calf (241:1F,1J) at 1250 m; one cow and calf (242:1F,1J) at 1225 m; one bull (243:1M) at 1100 m.
	M	Farther north along the slope, one bull (244:1M) at 1175 m.
	M	Back on the S. end, lower, cow and calf (245: 1F,1J) at 1100 m; one bull (246:1M) at 1000 m.

Location	Species	Remarks
MAP NO. 94 F/6 (3)		
Mount Paul	M	One cow and calf (247:1F,1J) on the steep, SE-facing aspen slope, 950 m.
MAP NO. 94 F/6 (4,3)		
Finbow area	M	Riparian and second growth habitats look good good here, but few tracks.
Paul Creek	M	A few old tracks seen in riparian meadows along the upper creek, at the edge of a burn that looks good, but snow depth appears excessive; measured downstream from the tracks, 80 cm after much settling in this warm weather (now +7° C).
Mount Paul	M	One set of fresh tracks along the SW-facing side, but no animals; snow looks deeper here than on Mt. Grave.
TO FINBOW FOR FUEL		
MAP NO. 94 F/6 (4)		
Finbow area	M	A few tracks in riparian situations; thick timber in adjacent uplands.
MAP MO. 94 F/5 (2.1)		
Fort Ware area		Farther upstream, to Ware, there is relatively little deciduous cover; a few tracks glimpsed under upland conifer, but sign is generally sparse—even in the occasional patches and islands of riparian habitat.
Finlay River		From Ware, working back down the river along the west side.
	BV M	Large beaver dam on Foot Lake, and a few moose tracks in that area.
MAP NO. 94 F/6 (4)		
Finlay River	W	One fresh wolf track seen along a side-channel and for a short distance downstream along the river.
MAP NO. 94 F/3 (10)		
Russell Crk. area	M	Several unnamed lakes and low aspen-covered knolls, and several fresh moose tracks seen; one bull and one cow (248:1M,1F) seen in mixed pine/aspen just to the east, 850 m.
MAP NO. 94 F/3 (11)		
McGraw Creek	M	One cow and calf (249:1F,1J) on a burned plateau just north of the creek, 1050 m.
	M	Small cow, probably a yearling (250:1F) downslope in the same burn, 800 m; the snow was 51 cm deep in an opening nearby.
	C	Tracks and cratering by caribou seen in a regenerating pine stand on flats south of McGraw Creek.

Location	Species	Remarks
MAP NO. 94 F/3 (12)		
McGraw Creek area	M	One cow and one bull (251:1M,1F), then a single cow (252:1F) seen in thick regen. pine (burn) at 775 m, near the river.
	M	Single cows (253:1F; 254:1F) farther upslope in the same burn, 800 m.
MAP NO. 94 F/3 (11,12)		
Del Creek	M	Sidetrip from the west side of the Finlay to a burned slope well upstream; a few old tracks along the lower S-facing slope, then single bulls (255:1M; 256:1M) seen in high aspen (1175 and 1050 m, respectively; both were in belly-deep snow.
MAP NO. 94 F/3 (13)		
Back to the Finlay	M	Two bulls (257:2M) on a cottonwood island a few km above the mouth of the Akie, 700 m.
MAP NO. 94 C/14 (25		
Lower Finlay River		Tracks fairly common in riparian situations, but no more moose seen along the west side of the lower Finlay.
DOWN FOR FUEL AT INGENIKA		
MAP NO. 94 C/14 (26)		
Ingenika River	M	One cow and calf (258:1F,1J) on a south-facing aspen slope, 875 m.
	M	Moose kill with skidoo tracks leading to it.
MAP NO. 94 C/11 (36)		
Lower Ingenika	M	Many tracks both in riparian willow along the floodplain and in the burn upslope.
Ingenika Crag	M	Fresh tracks to 925 m and old tracks above that, S-facing slope downstream from the crag, and fresh tracks to 1225 m on the same slope west of the crag.
MAP MO. 94 C/11 (35)		
Ingenika Burn	E	Two spike bull elk (259:2M), 1075 m on the steep, S-facing aspen slope; tracks indicated others were probably also present in the area.
Ingenika Burn	M	One bull (260:1M) in aspen high on the slope, 1250 m; then a cow and calf (261:1F,1J) a short distance away, 1200 m.
	M	One bull (262:1M), same burned slope at 1175 m.
	M	One cow (263:1F), 1075 m, then a cow and calf (264:1F,1J) about 100 m farther upslope, 1125 m.
	M	Two single cows, one at 1100 m (265:1F) and the other at 1025 m (266:1F).

Location	Species	Remarks
Ingenika Burn	M	One cow (267:1F) at 950 m.
	M	Two bulls (268:2M) at 1025 m, then singles at 1000 (269:1M; 270:1M).
	M	One bull (271:1M), then two cow/calf pairs (272:1F,1J; 273:1F,1J), all at about 975 m.
	M	One bull with 2-point antlers and one cow (274:1M,1F), then a cow with 2 calves (275:1F,2J), all at 950 m.
	M	Two single cows (276:1F; 277:1F) at 925 m, still in the burn.
	E	One female elk (278:1F), lower slope at 900 m.
Ingenika River	M	Two cows (279:2F) in riparian habitat along an oxbow slough; another human kill seen beside a snowmobile trail here.
	M	Several cow/calf pairs in river bottom willow and/or poplar: (280:1F,1J; 281:1F,1J; 282:1F,1J; 283:1F,1J), and then a single cow (284:1F).
Creek "A"	M	One cow and calf (285:1F,1J) in thick riparian cover along a tributary stream.
MAP NO. 94 C/14 (24) Pelly Creek area	M	One cow and one unclassified adult (286:1F,1A) in thick, mixed forest (pine/spruce/aspen) on the high (850 m), S-facing bench above the river.
	M	One bull (287:1M) in aspen at 850 m.
MAP NO. 94 C/11 (35)	M	One cow and calf (288:1F,1J) in spruce/aspen flats along the river, a few km downstream.
MAP NO. 94 C/14 (24) Pelly Creek	W	Wolf trail along the river from about the mouth of the creek and on upstream; minimum of 5 animals.
	M	A few tracks present on the bench above lower Pelly Crk; no time to explore that stream now.
MAP NO. 94 C/13 (23) Upper Ingenika R.	M	Hurriedly covered a long section above Pelly Creek, in order to finish before dark; the river above Pelly meanders through a mostly conifer-covered floodplain with numerous muskegs; fairs numbers of moose tracks up to just above Wrede Creek, both along the river and on the adjacent S-facing bench.

Location	Species	Remarks
MAP NO. 94 C/13 (22)		
Above Wrede Creek	M	Fewer fresh tracks, and the valley bottom is closing in; probably less wintering potential on the Ingenika from here on up.
Wrede Creek area	M	Large bull (289:1M) belly deep in snow in a small clearing in thick spruce/aspen.
	M	One cow (290:1F) along the creek; this is a good-sized burn, with shrub and conifer regen, looking good for moose use.
	M	Three cows (291:3F) on a north-facing slope, 925 m, in thick burn regen.
MAP MO. 94 C/13 (23)		
Ingenika River		Back down along the south (north-facing) side of the valley.
	M	Two bulls (292:2M) in open spruce cover along the river.
	M	One bull and two cows (293:1M,2F), on a riparian shrub bar in the river.
MAP NO. 94 C/11 (35)		
Lower Ingenika River	M	One cow and calf (294:1F,1J) up in the north-facing burn, 1050 m.
	M	One cow and calf (295:1F,1J) in riparian willow near the river.
	M	One cow and calf (296:1F,1J), at 950 m in the north-facing burn.

END OF DAY (VICINITY OF SWANNELL RIVER MOUTH).

25 FEBRUARY 1990: HIGH, THIN OVERCAST, WITH BREAKS TO THE BLUE IN AM, CLEARING LATER; WARM (UP TO +7°), AND WINDS LIGHT TO MODERATE.

MAP NO. 94 F/3 (13)		
Akie Mountain	M W	Working the uplands between the Akie and Pesika Rivers; one set of fresh moose tracks seen in subalpine balsam at 1350 m, and a set of wolf tracks at 1450 m.
	C	Three caribou, an apparent cow/calf/yrlg trio (297:1F,1J,1Y), on the first alpine ridge to the south; there are tracks along most of the ridges in this area, suggesting more than three caribou, but no others seen.
MAP NO. 94 F/2 (17,14)		
Akie Range	SS	Next mountain block to the north, south of "Trib B" to the Akie; mostly snowbound, but three ewes (298:3F) seen on a low, rocky ridge off the north end.

Location	Species	Remarks
MAP MO. 94 F/2 (15.16)		
	C	Next mountain block, between the big bend of the Akie and the upper Peska: summer trails seen on exposed slopes along the east side, and one group of seven caribou (299:4F,3J) seen on a windswept ridge, at 1625 m.
MAP NO. 94 F/7 (6)		
North end	C	Two medium-antlered bulls with a cow and calf (300:2M,1F,1J), on a long narrow ridge, then two cows (301:2F) on a similar ridge farther west; there are summer trails along most of these north-facing ridges.
	C	Three more groups of caribou on successive north-facing ridges: one cow (302:1F), then a cow and calf with an unclassified adult (303:1F,1J,1A), and then five adults (304:5A).
MAP NO. 94 F/2 (15)		
Akie-Pesika uplands	G	One billy (305:1M) on a rocky promontory over the north fork of "Trib. B", then seven animals including one kid (306:1F,1J,5A) on cliffs around the corner to the south, all at about 1825 m.
MAP NO. 94 F/7 (6)		
Upper Akie River		Back down to the river, picking up at the outfitter's cabins where we left off
	M	yesterday and heading upstream along the south side of the valley; one cow and calf (307:1F,1J) bedded on the river ice just upstream, 900 m.
Upper Akie River	W	Old wolf trail along the river, with track splitting indicating a minimum of 5 animals.
NO. 94 F/8 (8)		
Upper Akie burn	M	A few scattered tracks up to the north edge of the burn, but only one upstream from there to the main headwaters fork; heading back downstream along the S-facing side.
	E	Tracks and craters seen along the steep S-facing burn at several locations.
MAP NO. 94 F/7 (7)		
Upper Akie burn	E	Several seen scattered along the slope, in three main groups as follows: upper level (1100 m), nine including one medium bull (308:1M,8U), then six (309:6U); lower level (1025 M), two medium and two small bulls (310:4M), then two medium bulls (311:2M), and finally one large (6 pt) bull (312:1M).
		No more animals or significant sign from the elk location back to the outfitter's cabins.

* * * END OF SURVEYS * * *

APPENDIX 2. SUMMARY OF WILDLIFE OBSERVATION DATA FROM SURVEYS IN THE NORTHERN WILLISTON RESERVOIR AREA, BRITISH COLUMBIA, 1990 (a condensation from detailed notes in Appendix 1).

OBS. NO.	SP.	M.U.	MAP SHEET[1]	MAP[2]	HAB[3]	ELEV. (m)	NUMBERS/COMPOSITION[4] M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE														
1	M	7-37	B/5	57	RS	700	1	1	-	-	-	2	-	-
2	M	7-37	B/5	57	RS	750	1	-	-	-	-	1	1	-
4	M	7-37	B/5	55	UC	725	-	1	-	-	-	1	-	-
5	M	7-37	B/5	55	BU	875	1	-	-	-	-	1	-	-
6	M	7-37	B/5	55	BU	850	-	1	1	-	-	2	-	-
7	M	7-37	B/5	55	BU	1050	-	1	-	-	-	1	-	-
8	M	7-37	B/5	55	BU	1025	1	-	-	-	-	1	-	-
9	M	7-37	B/5	55	BU	975	-	1	-	-	-	1	-	-
10	M	7-37	B/5	55	BU	1100	1	-	-	-	-	1	-	-
11	M	7-37	B/5	57	BU	975	-	1	1	-	-	2	-	-
12	M	7-37	B/5	57	BU	1000	1					1		
13	M	7-37	B/5	57	BU	900	2	1	-	-	-	3	-	-
14	M	7-37	B/5	57	BU	800	-	2	-	-	-	2	-	-
15	M	7-37	B/5	57	BU	800	1	-	-	-	-	1	-	-
16	M	7-37	B/5	57	BU	750	-	2	-	-	-	2	-	-
17	M	7-37	C/8	54	UD	775	-	1	-	-	-	1	-	-
18	M	7-37	C/8	54	UD	750	1	-	-	-	-	1	-	-
19	M	7-37	C/8	54	UD	875	1	-	-	-	-	1	-	-
20	M	7-37	C/8	54	UD	875	-	1	-	-	-	1	-	-
21	M	7-37	C/8	54	UC	725	1	-	-	-	-	1	1	-
22	M	7-37	C/8	54	UC	700	-	1	-	-	-	1	-	-
23	M	7-37	C/8	54	UC	700	2	-	-	-	-	2	-	-
24	M	7-37	C/8	54	MX	700	-	1	-	-	-	1	-	-
25	M	7-37	C/8	54	MX	700	-	1	-	-	-	1	-	-
26	M	7-37	C/8	54	MX	775	-	1	-	-	-	1	-	-
27	M	7-37	C/8	54	UD	800	-	1	-	-	-	1	-	-
28	M	7-37	C/8	54	MX	725	1	-	-	-	-	1	-	-
29	M	7-37	C/8	54	UC	750	1	-	-	-	-	1	1	-
30	M	7-37	C/8	54	UD	775	1	-	-	-	-	1	-	-
32	M	7-37	C/8	54	UD	950	-	1	1	-	-	2	-	-
33	M	7-37	C/8	54	UD	950	-	1	1	-	-	2	-	-
34	M	7-37	C/8	54	UD	1025	2	-	-	-	-	2	-	-
35	M	7-37	C/8	54	UD	1225	1	-	-	-	-	1	-	-
56	M	7-37	C/9	44	MX	975	-	1	1	-	-	2	-	-
57	M	7-37	C/8	53	MX	1000	-	1	1	-	-	2	-	-
58	M	7-37	C/8	54	MX	700	1	-	-	-	-	1	-	-
59	M	7-37	C/8	54	RS	725	1	-	-	-	-	1	-	-
60	M	7-37	C/8	54	MU	725	2	-	-	-	-	2	-	-
61	M	7-37	C/8	54	RS	750	1	-	-	-	-	1	-	-
62	M	7-37	C/8	54	RS	725	2	-	-	-	-	2	-	-
63	M	7-37	C/8	54	RS	725	-	1	1	-	-	2	-	-
64	M	7-37	C/8	54	RS	725	-	1	-	-	-	1	-	-
65	M	7-37	C/8	54	RS	725	-	1	-	-	-	1	-	-
66	M	7-37	C/8	54	RS	750	1	-	-	-	-	1	-	-
67	M	7-37	C/8	54	MX	800	2	-	-	-	-	2		
68	M	7-37	C/8	54	MX	850	1	-	-	-	-	1	-	-
69	M	7-37	C/8	54	UD	750	1	-	-	-	-	1	-	-
70	M	7-37	C/8	51	RS	800	1	-	-	-	-	1	-	-

SPECIES OBS. NO.	SP.	M.U.	MAP SHEET*	MAP#	HAB*	ELEV. (m)	NUMBERS/COMPOSITION* M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE (continued)														
71	M	7-37	C/8	51	RS	800	1	-	-	-	-	1	-	-
72	M	7-37	B/12	46	BU	900	-	-	-	2	-	2	-	-
73	M	7-37	B/12	46	BU	850	1	-	-	-	-	1	-	-
74	M	7-37	C/9	42	BU	850	1	-	-	-	-	1	-	-
75	M	7-37	C/9	42	BU	850	1	3	-	-	-	4	-	-
76	M	7-37	C/9	42	BU	900	1	-	-	-	-	1	-	-
77	M	7-37	C/9	42	BU	925	-	1	1	-	-	2	-	-
78	M	7-37	C/9	42	BU	900	-	2	-	-	-	2	-	-
79	M	7-37	C/16	46	BU	975	3	1	-	-	-	4	-	-
80	M	7-37	C/16	46	BU	925	1	-	-	-	-	1	-	-
81	M	7-37	C/16	46	BU	1025	1	-	-	-	-	1	-	-
82	M	7-37	C/16	42	BU	875	1	-	-	-	-	1	-	-
83	M	7-37	C/16	42	BU	875	3	-	-	-	-	3	-	-
84	M	7-37	C/16	42	BU	850	1	-	-	-	-	1	-	-
85	M	7-37	C/16	33	RS	850	-	1	1	-	-	2	-	-
86	M	7-37	C/16	33	BU	900	1	1	-	-	-	2	-	-
87	M	7-37	C/16	33	BU	925	1	1	-	-	-	2	-	-
88	M	7-37	C/16	33	BU	925	2	-	-	-	-	2	-	-
89	M	7-37	C/16	33	BU	900	-	1	-	-	-	1	-	-
90	M	7-37	C/16	33	BU	1000	2	-	-	-	-	2	-	-
91	M	7-37	C/16	33	BU	900	-	1	-	-	-	1	-	-
92	M	7-37	C/16	34	BU	1100	2	-	-	-	-	2	-	-
93	M	7-37	C/16	34	BU	1125	-	1	-	-	-	1	-	-
94	M	7-37	C/16	34	BU	1075	1	-	-	-	-	1	1	-
95	M	7-37	C/16	34	BU	1050	2	2	-	-	-	4	-	-
96	M	7-37	C/16	34	BU	1100	1	-	-	-	-	1	-	-
97	M	7-37	C/16	34	BU	1025	2	-	-	-	-	2	-	-
98	M	7-37	C/16	34	BU	1000	4	-	-	-	-	4	-	-
99	M	7-37	C/16	34	BU	975	-	1	1	-	-	2	-	-
100	M	7-37	C/16	34	BU	1025	2	-	-	-	-	2	-	-
101	M	7-37	C/16	34	BU	1100	2	-	-	-	-	2	-	-
102	M	7-37	C/16	34	BU	1000	-	1	-	-	-	1	-	-
103	M	7-37	C/16	34	BU	975	2	-	-	-	-	2	-	-
104	M	7-37	C/16	34	BU	1000	-	1	-	-	-	1	-	-
105	M	7-37	C/16	34	BU	900	1	-	-	-	-	1	-	-
106	M	7-37	C/16	34	BU	1050	-	1	-	-	-	1	-	-
107	M	7-37	C/16	34	BU	1125	1	-	-	-	-	1	-	-
108	M	7-37	C/16	34	BU	1225	2	-	-	-	-	2	-	-
109	M	7-37	C/16	34	BU	1150	-	1	-	-	-	1	-	-
110	M	7-37	C/16	34	BU	1100	-	1	-	-	-	1	-	-
111	M	7-37	C/16	34	BU	1050	1	-	-	-	-	1	-	-
112	M	7-37	C/16	34	BU	1000	1	-	-	-	-	1	-	-
113	M	7-37	C/16	34	BU	1000	1	-	-	-	-	1	-	-
114	M	7-37	C/16	34	BU	950	2	-	-	-	-	2	-	-
115	M	7-37	C/16	34	BU	925	-	1	-	-	-	1	-	-
116	M	7-37	C/16	34	BU	925	1	-	-	-	-	1	-	-
117	M	7-37	C/16	34	BU	925	1	-	-	-	-	1	-	-
118	M	7-37	C/16	33	BU	1000	1	-	-	-	-	1	-	-
119	M	7-37	C/16	33	BU	925	2	-	-	-	-	2	-	-
120	M	7-37	C/16	33	BU	1000	1	-	-	-	-	1	-	-
121	M	7-37	C/16	33	BU	925	1	-	-	-	-	1	-	-

OBS. NO.	SP.	M.U.	MAP SHEET*	MAP*	HAB*	ELEV. (m)	NUMBERS/COMPOSITION* M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE (continued)														
122	M	7-37	C/16	33	BU	975	1	1	-	-	-	2	-	-
123	M	7-37	C/16	33	BU	1025	-	1	1	-	-	2	-	-
124	M	7-37	C/16	33	BU	1075	-	1	-	-	-	1	-	-
125	M	7-37	C/16	33	BU	1100	2	-	-	-	-	2	-	-
126	M	7-37	C/16	33	BU	1050	-	1	-	-	-	1	-	-
127	M	7-37	C/1	59	UD	750	4	-	-	-	-	4	-	-
128	M	7-37	C/1	59	UD	700	-	1	-	-	-	1	-	-
129	M	7-37	C/1	59	UD	1000	-	1	1	-	-	2	-	-
130	M	7-37	C/1	59	UD	775	-	1	1	-	-	2	-	-
131	M	7-37	C/1	59	UC	750	1	-	-	-	-	1	1	-
132	M	7-37	C/8	53	UD	750	1	-	-	-	-	1	1	-
133	M	7-37	C/8	53	UD	725	3	-	-	-	-	3	-	-
134	M	7-37	C/8	53	UD	775	-	1	1	-	-	2	-	-
135	M	7-37	C/8	53	UD	800	1	-	-	-	-	1	-	-
136	M	7-37	C/8	53	UD	900	1	-	-	-	-	1	-	-
137	M	7-37	C/8	53	UD	900	-	1	-	-	-	1	-	-
138	M	7-37	C/8	53	UD	800	-	1	2	-	-	3	-	1
139	M	7-37	C/8	53	UD	725	1	-	-	-	-	1	-	-
140	M	7-37	C/8	53	UD	700	-	1	-	-	-	1	-	-
141	M	7-37	C/8	51	UD	700	1	-	-	-	-	1	-	-
142	M	7-37	C/8	52	MX	750	-	1	1	-	-	2	-	-
143	M	7-37	C/8	51	MX	725	-	1	-	-	-	1	-	-
144	M	7-37	C/8	51	UD	750	1	-	-	-	-	1	-	-
145	M	7-37	C/8	53	UD	850	-	1	1	-	-	2	-	-
146	M	7-37	C/8	50	CT	725	-	1	-	-	-	1	-	-
147	M	7-37	C/8	50	CT	725	1	-	-	-	-	1	-	-
148	M	7-37	C/8	50	CB	725	-	1	-	-	-	1	-	-
149	M	7-37	C/8	50	CB	725	1	-	-	-	-	1	-	-
150	M	7-37	C/8	50	CB	725	-	2	-	-	-	2	-	-
151	M	7-37	C/8	50	CT	725	1	1	-	-	-	2	-	-
152	M	7-37	C/8	50	CB	725	-	1	-	-	-	1	-	-
153	M	7-37	C/8	50	RS	750	2	-	-	-	-	2	-	-
154	M	7-37	C/9	43	MX	850	1	-	-	1	-	2	-	-
155	M	7-37	C/9	43	BU	800	-	1	1	-	-	2	-	-
156	M	7-37	C/9	43	BU	800	2	-	-	-	-	2	-	-
157	M	7-37	C/9	40	MX	825	2	-	-	-	-	2	-	-
158	M	7-37	C/9	43	CT	750	-	1	1	-	-	2	-	-
159	M	7-37	C/9	39	CB	800	1	-	-	-	-	1	-	-
160	M	7-37	C/16	33	MX	900	-	1	-	-	-	1	-	-
162	M	7-37	F/1	19	RS	1050	-	-	-	1	-	1	-	-
163	M	7-37	C/16	32	UC	1050	-	1	-	-	-	1	-	-
164	M	7-37	C/15	30	UC	850	1	-	-	1	-	2	-	-
167	M	7-37	C/10	37	BU	700	-	1	-	-	-	1	-	-
168	M	7-37	C/10	37	UD	700	-	1	1	-	-	2	-	-
169	M	7-37	C/10	37	MX	725	-	1	1	-	-	2	-	-
170	M	7-37	C/10	38	CT	750	-	1	-	-	-	1	-	-
172	M	7-37	C/8	53	BU	925	-	-	-	1	-	1	-	-
173	M	7-37	C/8	50	MU	675	-	-	-	1	-	1	-	-
174	M	7-37	C/8	50	CB	675	3	-	-	-	-	3	3	-
175	M	7-37	C/15	29	UD	900	1	-	-	-	-	1	-	-
176	M	7-37	C/15	29	UD	900	-	1	-	-	-	1	-	-

SPECIES OBS. NO.	SP.	M.U.	MAP SHEET[1]	MAP[2]	HAB[3]	ELEV. (m)	NUMBERS/COMPOSITION[4] M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE (continued)														
177	M	7-37	C/15	29	UC	725	-	1	1	-	-	2	-	-
178	M	7-37	C/15	29	UD	675	2	-	-	-	-	2	-	-
179	M	7-37	C/15	29	MX	775	-	1	1	-	-	2	-	-
180	M	7-37	C/15	29	BU	925	-	1	1	-	-	2	-	-
181	M	7-37	C/15	29	BU	925	-	-	1	-	-	1	-	-
182	M	7-37	C/15	29	BU	900	3	-	-	-	-	3	-	-
183	M	7-37	C/15	29	BU	1175	-	1	2	-	-	3	-	1
184	M	7-37	C/15	28	UD	975	-	1	1	-	-	2	-	-
185	M	7-37	C/15	28	UD	675	1	-	-	-	-	1	-	-
186	M	7-37	C/15	28	UD	675	-	1	1	-	-	2	-	-
187	M	7-37	C/15	28	UD	700	-	1	1	-	-	2	-	-
188	M	7-37	C/15	27	UD	1050	1	-	-	-	-	1	-	-
189	M	7-37	C/15	27	UD	975	1	-	-	-	-	1	-	-
191	M	7-37	C/15	27	MX	925	-	1	-	-	-	1	-	-
192	M	7-37	C/15	27	MX	900	1	-	-	-	-	1	-	-
193	M	7-41	C/14	25	UD	825	1	-	-	-	-	1	-	-
194	M	7-41	F/3	13	UD	800	1	-	-	-	-	1	-	-
195	M	7-41	F/3	13	UD	775	-	1	1	-	-	2	-	-
196	M	7-41	F/2	18	MX	975	2	-	-	-	-	2	-	-
197	M	7-41	F/3	13	UD	850	1	-	-	-	-	1	-	-
198	M	7-41	F/3	13	UD	925	2	-	-	-	-	2	-	-
199	M	7-41	F/2	17	MX	1075	-	1	1	-	-	2	-	-
200	M	7-41	F/3	13	UD	1025	1	-	-	-	-	1	-	-
201	M	7-41	F/3	13	UD	1050	1	-	-	-	-	1	-	-
202	M	7-41	F/3	13	BU	675	2	-	-	-	-	2	-	-
203	M	7-41	C/14	25	UD	675	1	-	-	-	-	1	-	-
204	M	7-41	F/3	13	UD	1075	-	1	-	-	-	1	-	-
205	M	7-41	F/3	13	RT	700	1	1	-	-	-	2	-	-
206	M	7-41	F/2	17	BU	975	1	-	-	-	-	1	-	-
207	M	7-41	F/2	14	BU	1000	1	-	-	-	-	1	-	-
208	M	7-41	F/2	14	RS	900	4	-	-	-	-	4	-	-
209	M	7-41	F/2	14	BU	850	2	-	-	-	-	2	-	-
210	M	7-41	F/2	14	BU	1150	2	-	-	-	-	2	-	-
211	M	7-41	F/2	14	BU	1150	1	-	-	-	-	1	-	-
212	M	7-41	F/2	14	BU	1125	-	1	1	-	-	2	-	-
213	M	7-41	F/2	14	BU	950	2	-	-	-	-	2	-	-
214	M	7-41	F/2	14	RS	775	1	-	-	-	-	1	-	-
215	M	7-41	F/2	14	RS	775	1	2	-	-	-	3	-	-
216	M	7-41	F/2	14	RS	800	2	2	-	-	-	4	-	-
217	M	7-41	F/2	14	RS	800	1	-	-	-	-	1	-	-
218	M	7-41	F/7	5	RS	775	1	-	-	-	-	1	-	-
219	M	7-41	F/7	5	RS	775	1	-	-	-	-	1	-	-
220	M	7-41	F/7	6	RS	825	1	-	-	-	-	1	-	-
221	M	7-41	F/7	6	RS	850	-	1	-	-	-	1	-	-
222	M	7-41	F/7	5	RS	800	2	-	-	-	-	2	-	-
223	M	7-41	F/2	14	RS	950	2	1	-	-	-	3	-	-
224	M	7-41	F/2	14	RS	750	-	1	-	-	-	1	-	-
225	M	7-41	F/2	14	BU	1050	3	-	-	-	-	3	-	-
226	M	7-41	F/2	14	BU	1050	1	-	-	-	-	1	-	-
227	M	7-41	F/2	14	BU	1100	1	-	-	-	-	1	-	-
228	M	7-41	F/3	13	BU	925	-	1	1	-	-	2	-	-

SPECIES OBS. NO.	SP.	M.U.	MAP SHEET[1]	MAP[2]	HAB[3]	ELEV. (m)	NUMBERS/COMPOSITION[4] M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE (continued)														
229	M	7-41	F/3	13	MX	900	3	-	-	-	-	3	1	-
230	M	7-41	C/14	25	UD	675	-	2	-	-	-	2	-	-
231	M	7-41	C/14	13	RS	650	1	-	-	-	-	1	-	-
232	M	7-41	C/14	13	RT	650	3	-	-	-	-	3	3	-
233	M	7-41	C/14	13	RT	650	-	1	1	-	-	2	-	-
234	M	7-41	C/14	13	RT	675	-	1	1	-	-	2	-	-
235	M	7-41	C/14	13	RT	675	-	2	-	-	-	2	-	-
236	M	7-41	C/14	13	RT	675	1	-	-	-	-	1	-	-
237	M	7-41	C/14	11	UC	750	1	-	-	-	-	1	1	-
238	M	7-41	C/14	11	BU	900	3	-	-	-	-	3	1	-
239	M	7-41	F/6	4	UD	1025	-	1	2	-	-	3	-	1
240	M	7-41	F/3	11	MX	1350	1	-	-	-	-	1	-	-
241	M	7-41	F/6	4	BU	1250	-	1	1	-	-	2	-	-
242	M	7-41	F/6	4	BU	1225	-	1	1	-	-	2	-	-
243	M	7-41	F/6	4	BU	1100	1	-	-	-	-	1	-	-
244	M	7-41	F/6	4	BU	1175	1	-	-	-	-	1	-	-
245	M	7-41	F/6	4	BU	1100	-	1	1	-	-	2	-	-
246	M	7-41	F/6	4	BU	1000	1	-	-	-	-	1	-	-
247	M	7-41	F/6	3	UD	950	-	1	1	-	-	2	-	-
248	M	7-40	F/3	10	MX	850	1	1	-	-	-	2	-	-
249	M	7-40	F/3	11	BU	1050	-	1	1	-	-	2	-	-
250	M	7-40	F/3	11	BU	800	-	1	-	-	-	1	-	-
251	M	7-40	F/3	12	BU	775	1	1	-	-	-	2	-	-
252	M	7-40	F/3	12	BU	775	-	1	-	-	-	1	-	-
253	M	7-40	F/3	12	BU	800	-	1	-	-	-	1	-	-
254	M	7-40	F/3	12	BU	800	-	1	-	-	-	1	-	-
255	M	7-41	F/3	11	UD	1175	1	-	-	-	-	1	-	-
256	M	7-41	F/3	11	UD	1050	1	-	-	-	-	1	-	-
257	M	7-40	F/3	13	RT	700	2	-	-	-	-	2	-	-
258	M	7-40	C/14	26	UD	875	-	1	1	-	-	2	-	-
260	M	7-40	C/14	35	BU	1250	1	-	-	-	-	1	-	-
261	M	7-40	C/14	35	BU	1200	-	1	1	-	-	2	-	-
262	M	7-40	C/14	35	BU	1175	1	-	-	-	-	1	-	-
263	M	7-40	C/14	35	BU	1075	-	1	-	-	-	1	-	-
264	M	7-40	C/14	35	BU	1125	-	1	1	-	-	2	-	-
265	M	7-40	C/14	35	BU	1100	-	1	-	-	-	1	-	-
266	M	7-40	C/14	35	BU	1025	-	1	-	-	-	1	-	-
267	M	7-40	C/14	35	BU	950	-	1	-	-	-	1	-	-
268	M	7-40	C/14	35	BU	1025	2	-	-	-	-	2	-	-
269	M	7-40	C/14	35	BU	1000	1	-	-	-	-	1	-	-
270	M	7-40	C/14	35	BU	1000	1	-	-	-	-	1	-	-
271	M	7-40	C/14	35	BU	975	1	-	-	-	-	1	-	-
272	M	7-40	C/14	35	BU	975	-	1	1	-	-	2	-	-
273	M	7-40	C/14	35	BU	975	-	1	1	-	-	2	-	-
274	M	7-40	C/14	35	BU	950	1	1	-	-	-	2	1	-
275	M	7-40	C/14	35	BU	950	-	1	2	-	-	3	-	1
276	M	7-40	C/14	35	BU	925	-	1	-	-	-	1	-	-
277	M	7-40	C/14	35	BU	925	-	1	-	-	-	1	-	-
279	M	7-40	C/14	35	RS	700	-	2	-	-	-	2	-	-
280	M	7-40	C/14	35	RS	700	-	1	1	-	-	2	-	-
281	M	7-40	C/14	35	RS	700	-	1	1	-	-	2	-	-

SPECIES OBS. NO.	SP.	M.U.	MAP SHEET[1]	MAP[2]	HAB[3]	ELEV. (m)	NUMBERS/COMPOSITION[4] M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOOSE (continued)														
282	M	7-40	C/14	35	RS	700	-	1	1	-	-	2	-	-
283	M	7-40	C/14	35	RS	725	-	1	1	-	-	2	-	-
284	M	7-40	C/14	35	RS	750	-	1	-	-	-	1	-	-
285	M	7-40	C/14	35	RS	775	-	1	1	-	-	2	-	-
286	M	7-40	C/14	24	MX	850	-	1	-	1	-	2	-	-
287	M	7-40	C/11	24	UD	850	1	-	-	-	-	1	-	-
288	M	7-40	C/13	35	RT	700	-	1	1	-	-	2	-	-
289	M	7-39	C/13	22	MX	750	1	-	-	-	-	1	-	-
290	M	7-39	C/13	22	BU	800	-	1	-	-	-	1	-	-
291	M	7-39	C/13	22	BU	925	-	3	-	-	-	3	-	-
292	M	7-39	C/13	23	RT	725	2	-	-	-	-	2	-	-
293	M	7-39	C/13	23	RT	725	1	2	-	-	-	3	-	-
294	M	7-39	C/11	35	BU	1050	-	1	1	-	-	2	-	-
295	M	7-39	C/11	36	RS	700	-	1	1	-	-	2	-	-
296	M	7-39	C/11	36	BU	950	-	1	1	-	-	2	-	-
307	M	7-41	F/7	6	RS	900	-	1	1	-	-	2	-	-
CARIBOU														
36	C	7-37	C/8	52	AL	1800	-	1	1	-	-	2	-	-
37	C	7-37	C/8	52	AL	1800	-	-	-	5	-	5	-	-
297	C	7-41	F/3	13	AL	1850	-	1	1	1	-	3	-	-
299	C	7-41	F/2	16	AL	1625	-	4	3	-	-	7	-	-
300	C	7-41	F/7	6	AL	1400	2	1	1	-	-	4	2	-
301	C	7-41	F/7	6	AL	1450	-	2	-	-	-	2	-	-
302	C	7-41	F/7	6	AL	1375	-	1	-	-	-	1	-	-
303	C	7-41	F/7	6	AL	1400	-	1	1	1	-	3	-	-
304	C	7-41	F/7	6	AL	1400	-	-	-	5	-	5	-	-
ELK														
3	E	7-37	B/5	57	UC	775	1	-	-	-	-	1	1	-
161	E	7-37	C/16	32	RS	900	1	-	-	-	-	1	1	-
259	E	7-40	C/14	35	UD	1075	2	-	-	-	-	2	2	-
78	E	7-40	C/14	35	BU	900	-	1	-	-	-	1	-	-
308	E	7-41	F/7	7	BU	1100	1	-	-	-	8	9	1	-
309	E	7-41	F/7	7	BU	1100	-	-	-	-	6	6	-	-
310	E	7-41	F/7	7	BU	1025	4	-	-	-	-	4	4	-
311	E	7-41	F/7	7	BU	1025	2	-	-	-	-	2	2	-
312	E	7-41	F/7	7	BU	1025	1	-	-	-	-	1	1	-
MULE DEER														
31	MD	7-37	C/8	54	UD	825	-	1	2	1	-	4	-	1
166	MD	7-37	C/15	29	UC	1000	-	-	-	-	5	5	-	-
MOUNTAIN GOAT														
38	G	7-37	C/9	45	SU	1550	-	1	1	-	-	2	-	-
39	G	7-37	C/9	45	SU	1700	-	-	-	5	-	5	-	-
40	G	7-37	C/9	45	AL	1750	-	-	2	-	12	14	-	-
41	G	7-37	C/9	45	AL	1500	1	-	-	-	-	1	-	-
42	G	7-37	C/9	45	AL	1550	-	-	-	1	-	1	-	-
43	G	7-37	C/9	45	SU	1650	-	-	-	1	-	1	-	-
44	G	7-37	C/9	45	AL	1750	-	-	2	-	7	9	-	-

SPECIES OBS. NO.	SP.	M.U.	MAP SHEET[1]	MAP[2]	HAB[3]	ELEV. (m)	NUMBERS/COMPOSITION[4] M	F	J	A	U	TOTAL	MALES WITH ANTLERS	SETS OF TWINS
MOUNTAIN GOAT (continued)														
45	G	7-37	C/9	45	AL	1650	-	1	1	-	-	2	-	-
46	G	7-37	C/9	44	AL	1650	-	1	1	1	-	3	-	-
47	G	7-37	C/9	45	AL	1700	-	2	2	1	-	5	-	-
48	G	7-37	C/9	45	AL	1750	-	-	-	1	-	1	-	-
49	G	7-37	C/9	45	AL	1700	-	-	2	-	5	7	-	-
50	G	7-37	C/9	45	AL	1750	-	-	-	1	-	1	-	-
51	G	7-37	C/9	45	AL	1750	-	-	-	1	-	1	-	-
53	G	7-37	C/9	44	AL	1600	1	-	-	-	-	1	-	-
54	G	7-37	C/9	41	AL	1600	3	-	-	-	-	3	-	-
55	G	7-37	C/9	41	AL	1650	-	-	-	1	-	1	-	-
165	G	7-37	C/15	29	MX	1000	-	-	-	1	-	1	-	-
171	G	7-37	B/5	57	AL	1675	-	-	-	1	-	1	-	-
190	G	7-37	C/15	27	SU	1200	-	1	1	-	-	2	-	-
305	G	7-41	F/2	15	AL	1825	1	-	-	-	-	1	-	-
306	G	7-41	F/2	15	AL	1825	-	1	1	5	-	7	-	-
STONE'S SHEEP														
298		7-41	F/2		AL	1400	-	3	-	-	-			
WOLVERINE														
52	WV	7-37	C/9		AL	1800	1	-	-	-	-			

[1]National Topographic Series, 1: 50 000 scale, all in range 94 (i.e., "B/5" is actually 94 B/5).

[2]Individual (page-size) map number, as compiled in Appendix 3.

[3]Habitats: AL = Alpine; BU = Burn; CB = Forestry cutblock; CT = Timber at the edge of a cutblock; MX = Mixed forest (conifer/deciduous); MU = Muskeg, bog; RS = Riparian shrub (mostly willow, alder); RT = Riparian timber (mostly cottonwood and/or spruce); SU = subalpine (mostly balsam); UC = Upland conifer (pine and/or spruce dominant); UD = Upland deciduous (aspen and/or birch dominant).

[4]M = Male, F = Female, J = Juvenile, A = Adult, unclassified to sex, and U = unclassified to either age or sex.

* * *

APPENDIX 3. Small format (page size) maps showing survey flight lines and observations, as described in Appendix 1 and summarized in Appendix 2.

LEGEND

Flight lines:

Observation Number: In brackets (e.g. [10]). These numbers correspond to the observation numbers (1-312) listed in Appendices 1 and 2.

Observations:

M = Moose, C = Caribou, E = Elk, MD = Mule Deer,
SS = Stone's Sheep, G = Mountain Goat, W = Wolf,
WV = Wolverine, BV = Beaver, F = Furbearer (general),
O = Other.

The number in front of the species abbreviation refers to the number of. animals seen, e.g., 2M = 2 moose.

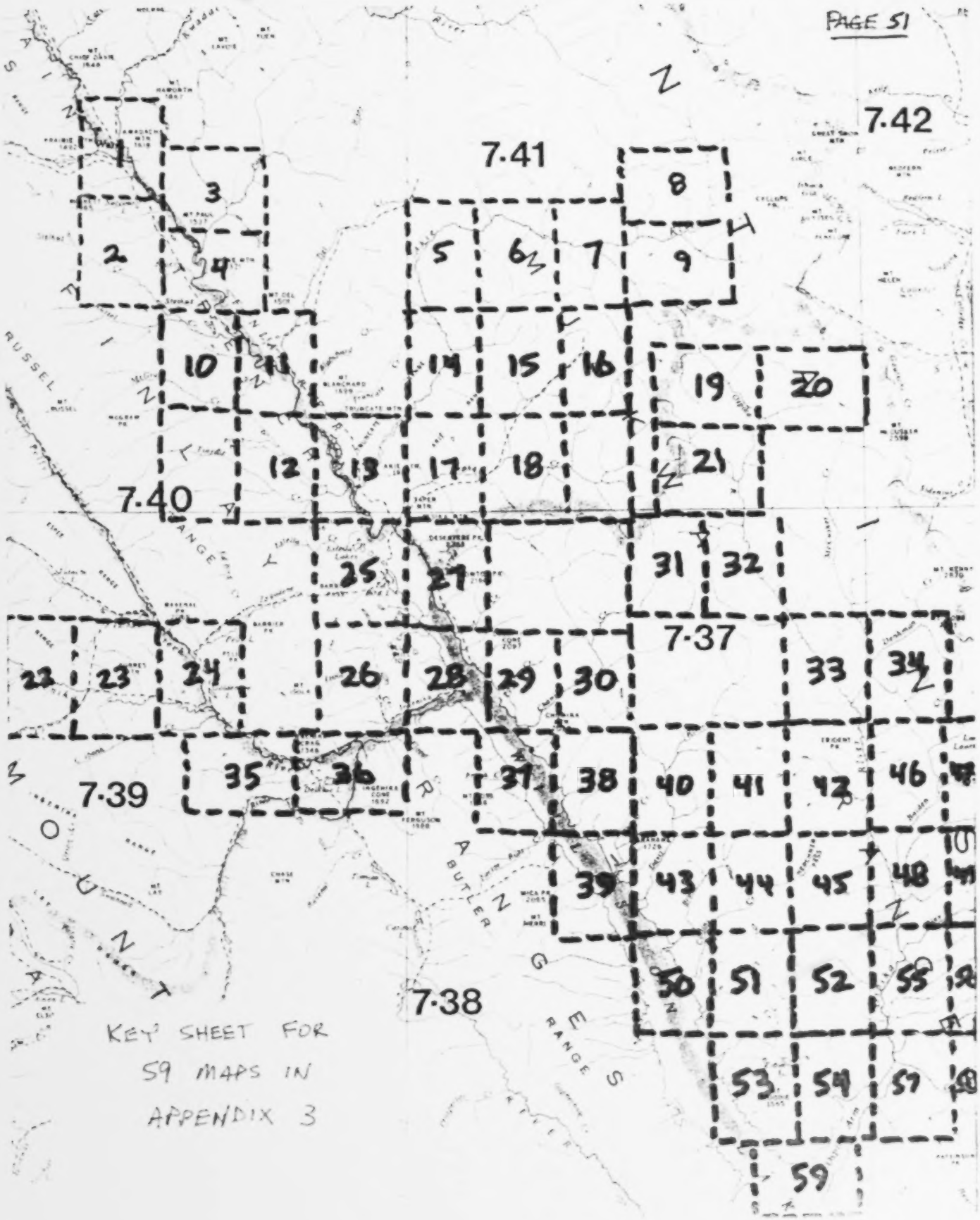
Tracks (Tx):

All entries refer to moose tracks unless indicated otherwise. In general, Tx was used in situations where fresh tracks were especially prominent and/or abundant, although not every set of tracks present is so represented. They can be thought of as indicated locations where we thought moose "should have been seen"—in at least some cases the individuals that made the tracks probably were seen eventually. A circle around the symbol for tracks (Tx) indicates old tracks only--signifying that one or more animals had been at that location in the past, but had apparently left.

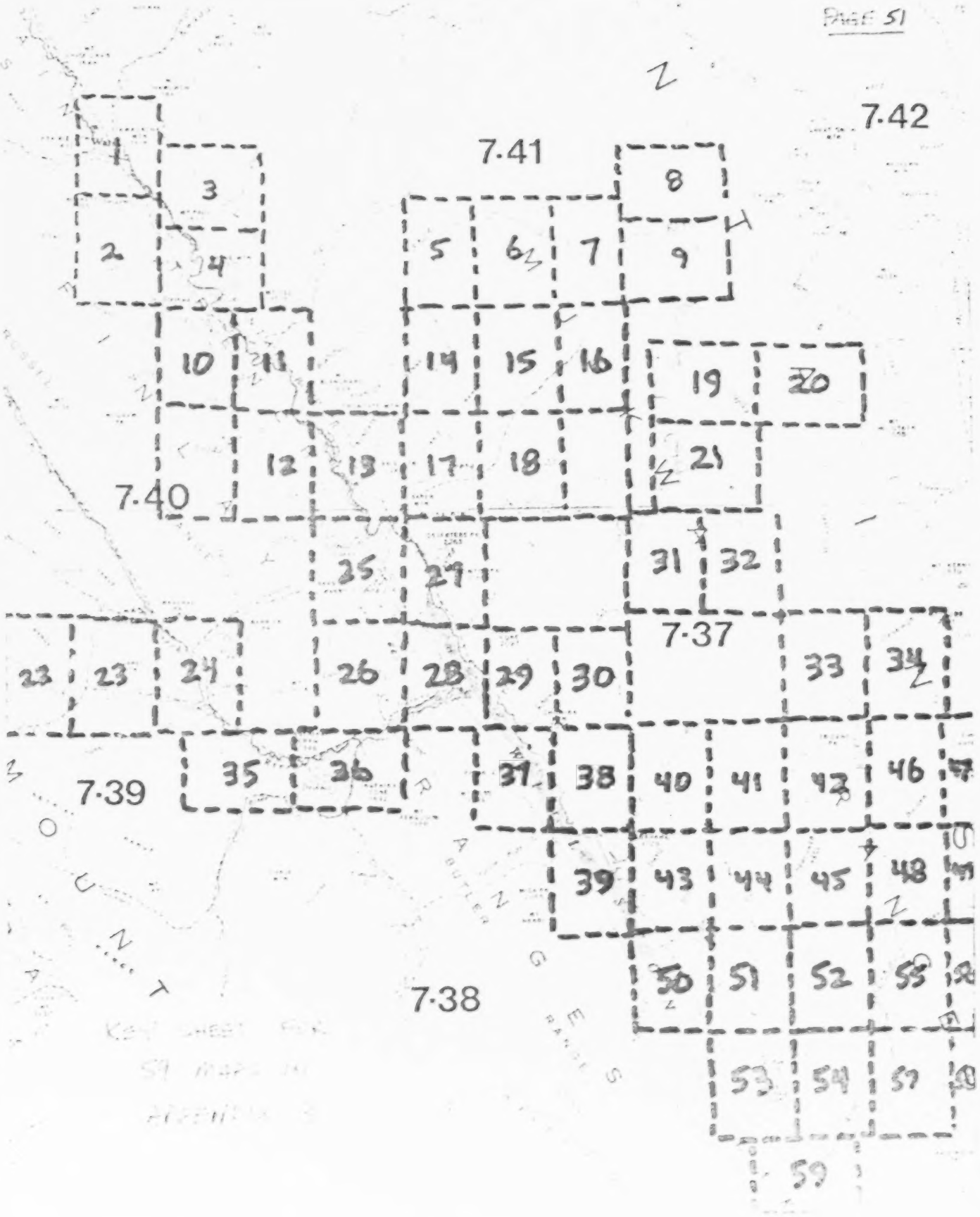
Cutblocks: Boundaries of cutblocks provided by unspecified MOE personnel are shown in red. The validity date(s) for source maps is not known, but it is unlikely that blocks cut after 1988 are shown. An "x" inside a cutblock indicates that it was not covered because it could be seen from a distance that it was too "new", too high, or otherwise unsuitable for wildlife use.

Snow Measurements: The number after the word "snow" indicates the mean depth, in cm, of three probes with a measuring stick.

* * * * *

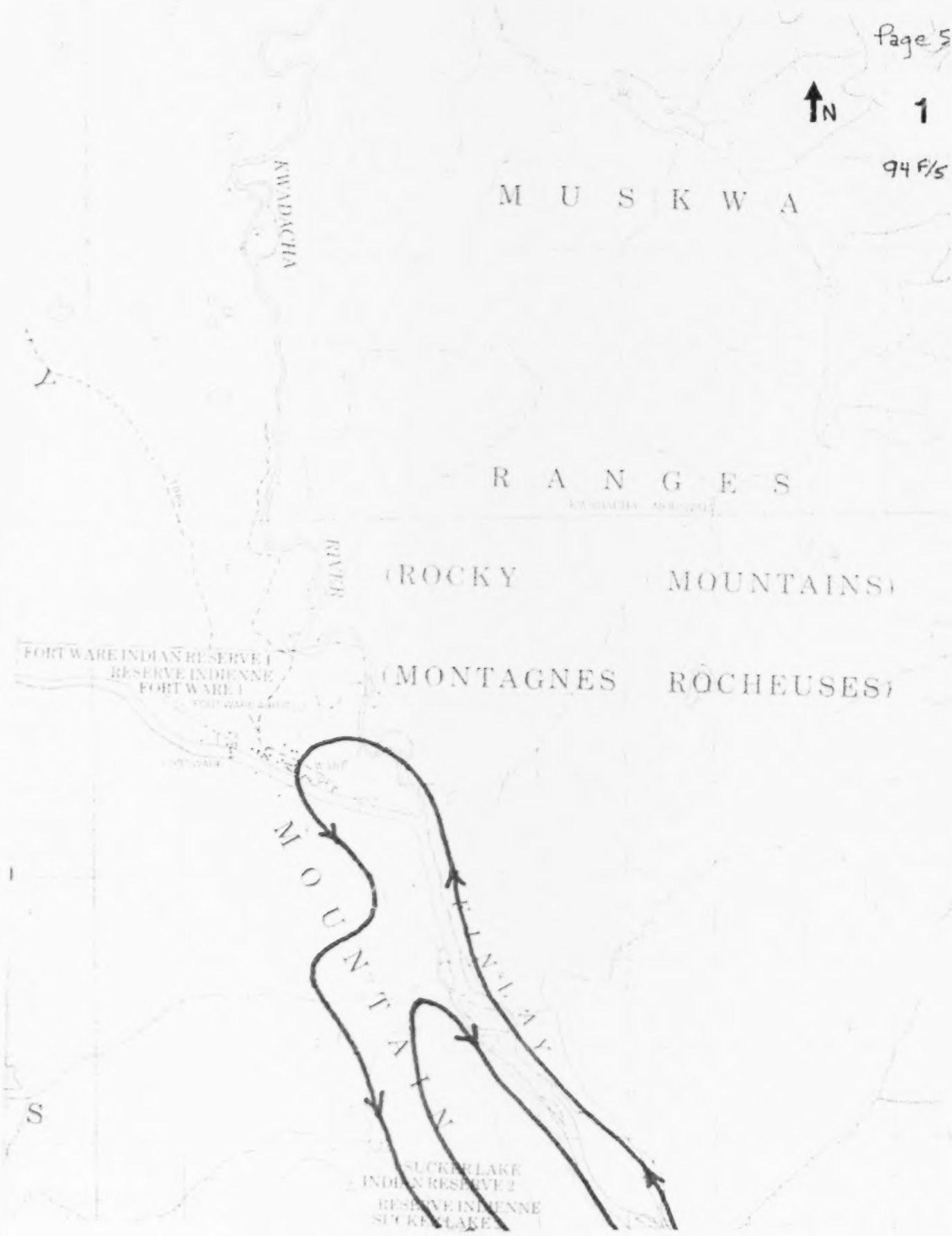


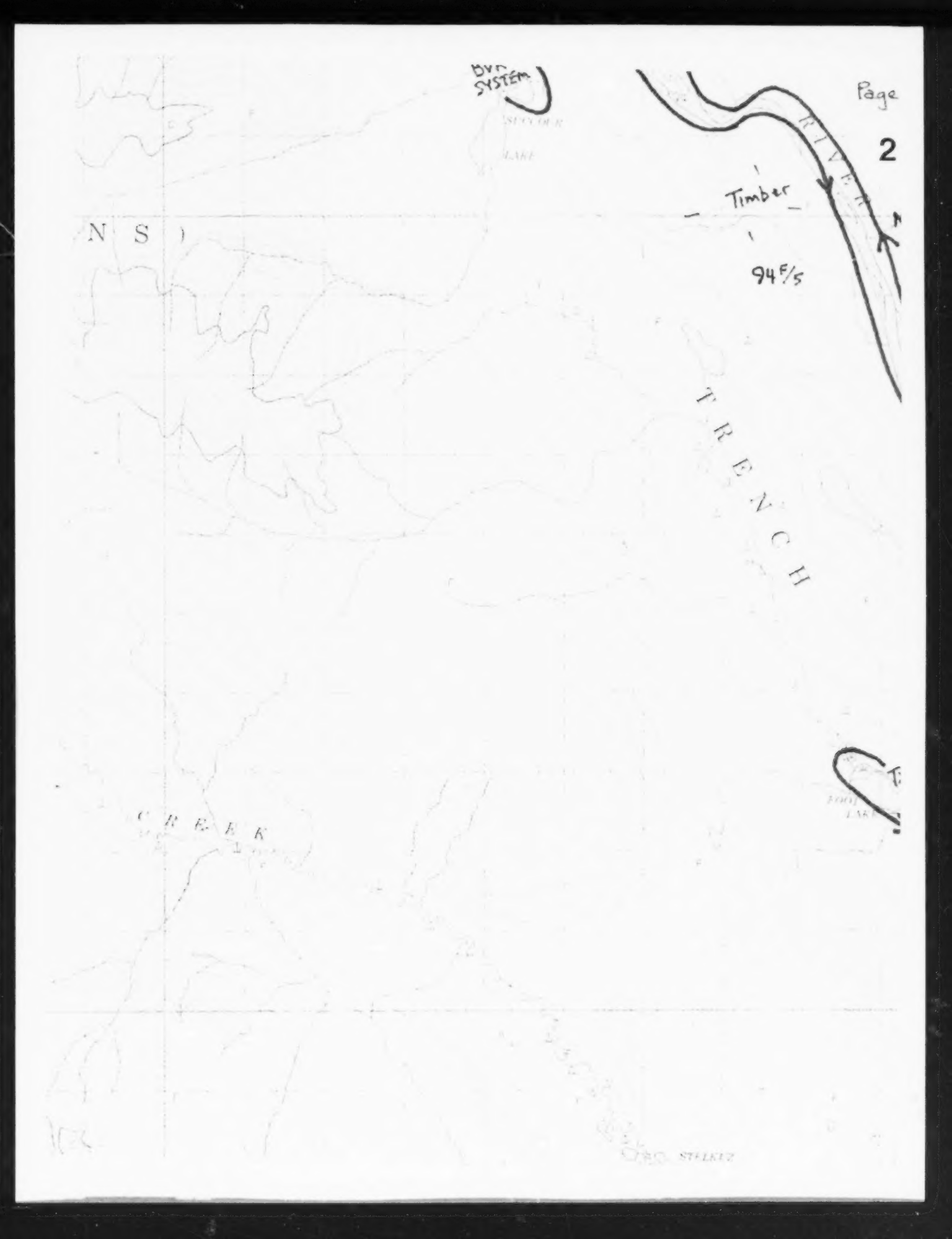
KEY SHEET FOR
59 MAPS IN
APPENDIX 3


7.42
7.41
7.40
7.37
7.39
7.38
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59

N 1

94 F/5


M U S K W A
AWADACHA
R A N G E S
(ROCKY MOUNTAINS)
(MONTAGNES ROCHEUSES)
FORT WARE INDIAN RESERVE 1
RESERVE INDIENNE
FORT WARE 1
M O U N T A I N
S


DVR SYSTEM
RIVER
Timber
94F/5
TRENCH
CREEK

3

94 F/b

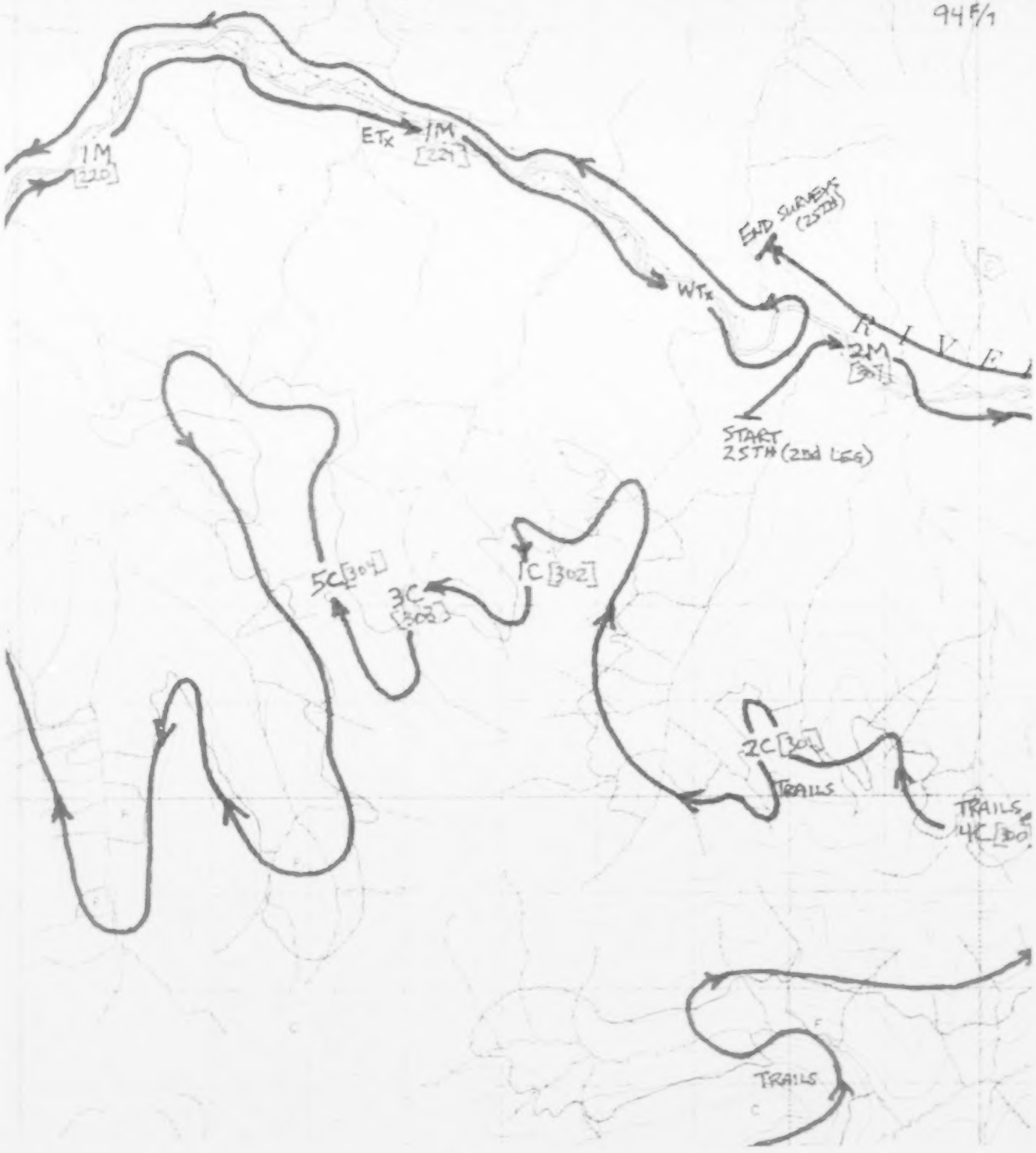
END 24TH AM
Tx
Tx
WTx
START 24TH PM
BURN
ROCKY
MOUNTAIN
TRENCH
Tx
Tx
Tx
Tx
Tx
Tx
Tx
Tx
1M [244]
1M - 2M - 2M
[243] [242] [241]
2M [245]
1M [246]
3M [239]
FEW Tx
FINLAY
RANGES
OMINECA
OUNTAINS
N
4
94½
Page 55

5

N

94 F/7

ONTAGNES ROCHEUSE 6



7

94 F/4

N

20'

REVISION

94 F/11

94 F/6

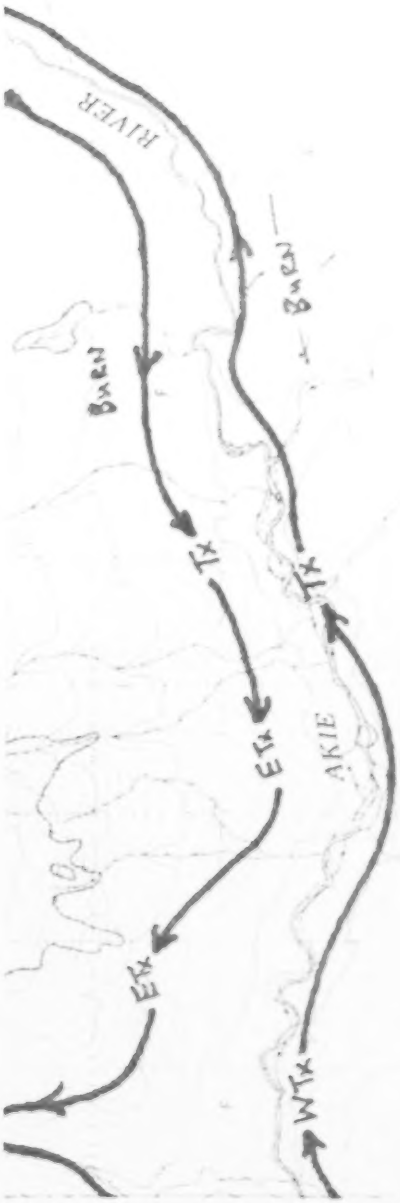
94 F/3

MUSKWA
94F/8
N
8

9

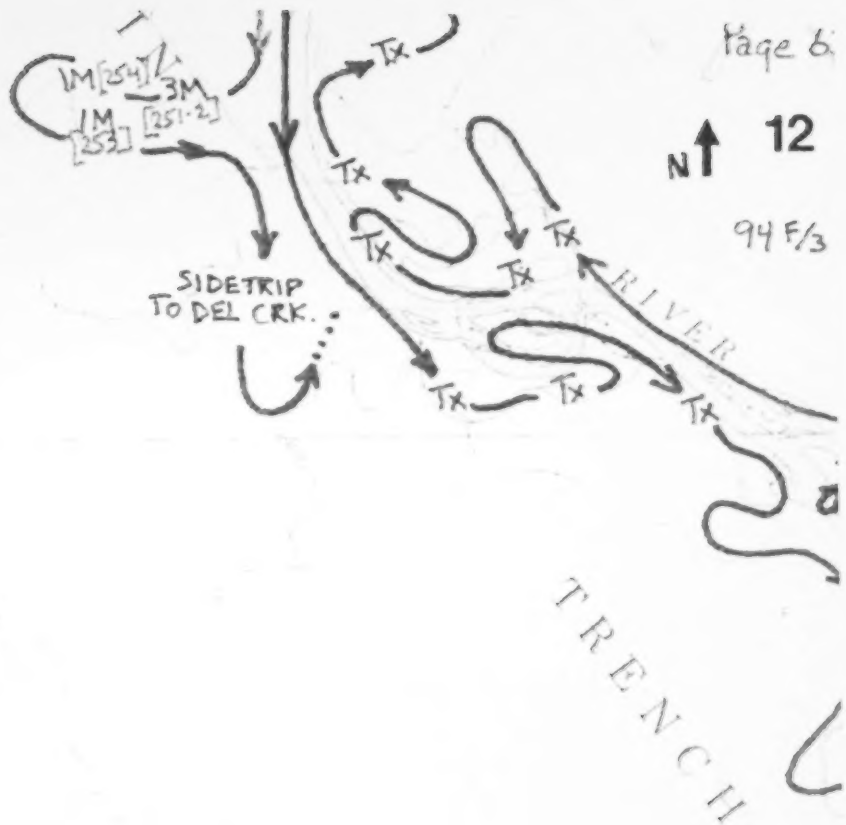
N

94 F/8



Page
1C
N
94F
SNOW Tx
42cm
2M
[248]
Tx/Tx
Tx
BNR SYSTEM
Tx
Tx
Tx
Tx
BURN
BURN
Tx
RUSSEL
CREEK
ROCKY
CREEK
McGRATH

N
11
94 F/3
1M [240]
BURN (ASPEN)
3M [238]
1M [255]
1M [256]
Tx
CREEK
24TH FM (SIDETRIP)
MUSKWA
1M [237]
Tx
Tx
SNOW 51 cm
Tx
1M [250]
2M [249]
Tx
Tx
Tx
BURN
Tx
CTx
BLANCHARD
MOUNTA



N 12

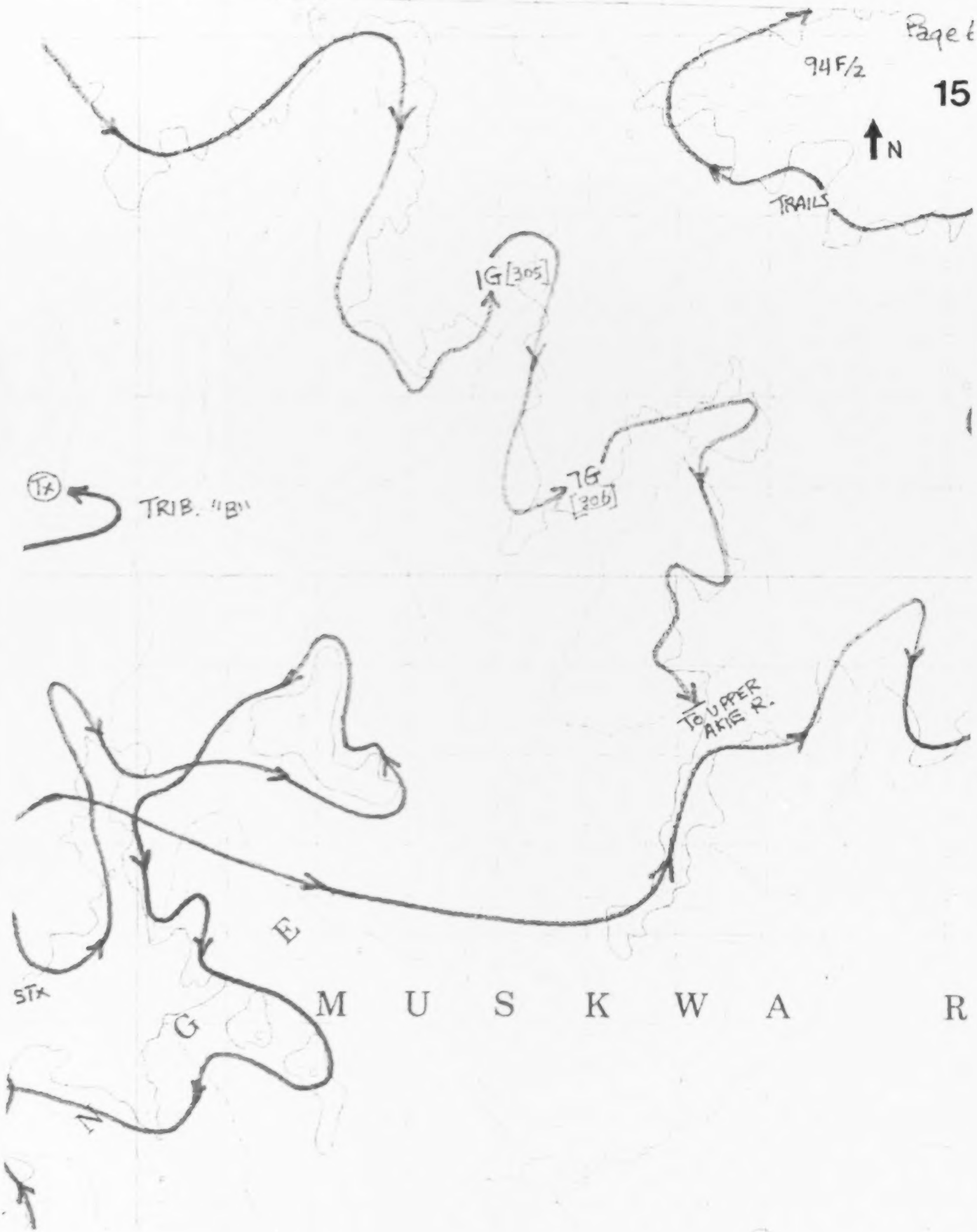
94 F/3

VDIZ

CREEK

94 F/3
N
Page
TRUNCATE
MOUNTAIN
Tx
2M [228]
3M [229]
ENP 23rd
2M [205]
AKIE
3C [197]
1M [235]
2M [234]
3M [232]
2M [233]
2M [257]
Timber
1M [231]
1M [204]
RANGE
WTx
START 25TH
1M [200]
1M [201]
2M [198]
1M [197]
2M [195]
1M [194]
2M

94 F/2
Page
14
N
Tx
Spruce
TRIB "C"
5M [216-17]
2M [212]
2M 1M [213] [211]
2M [210]
3M [215]
1M [214]
2M [209]
4M [208]
1M [207]
3M [223]
1M [224]
TRUNCATE
RANGE
RIVER
Tx
3M [225]
1M [226]
Tx
1M [227]
AKIE
3SS [199]


94F/2
N
TRAILS
1G [305]
7G [306]
TRIB. "B"
TO UPPER AXIS R.
E
G
N
MUSKWA R

94 F/2

16

N

10'

CREEK

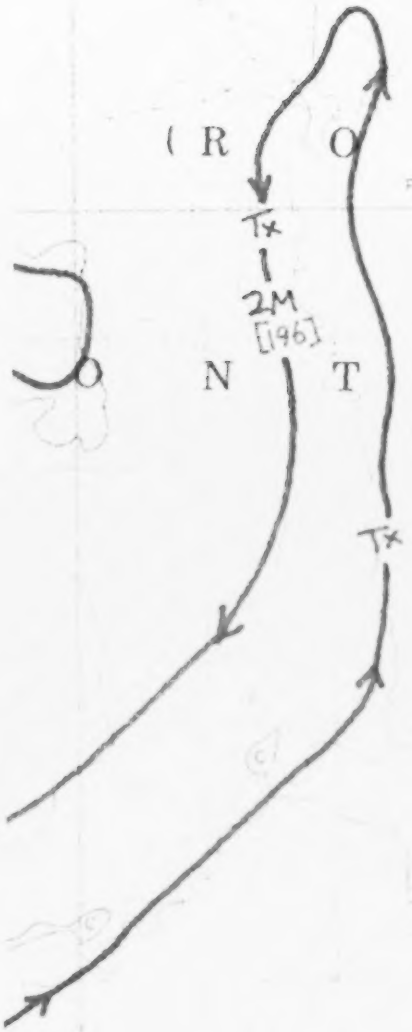
A N G E S

17
Page 66
94F/2
1M [206]
Tx
Tx
TRIB. "A"
R
I
E
K
A
M
CTx
BURN
Tx
Tx
Tx
Tx
PESIKA
WTx
2M [199]
D E S E R T E R
TAPER
MOUNTAIN
R A N G E

94F/2

18

N



ROCKY MOU

ONTAGNES R

CREEK

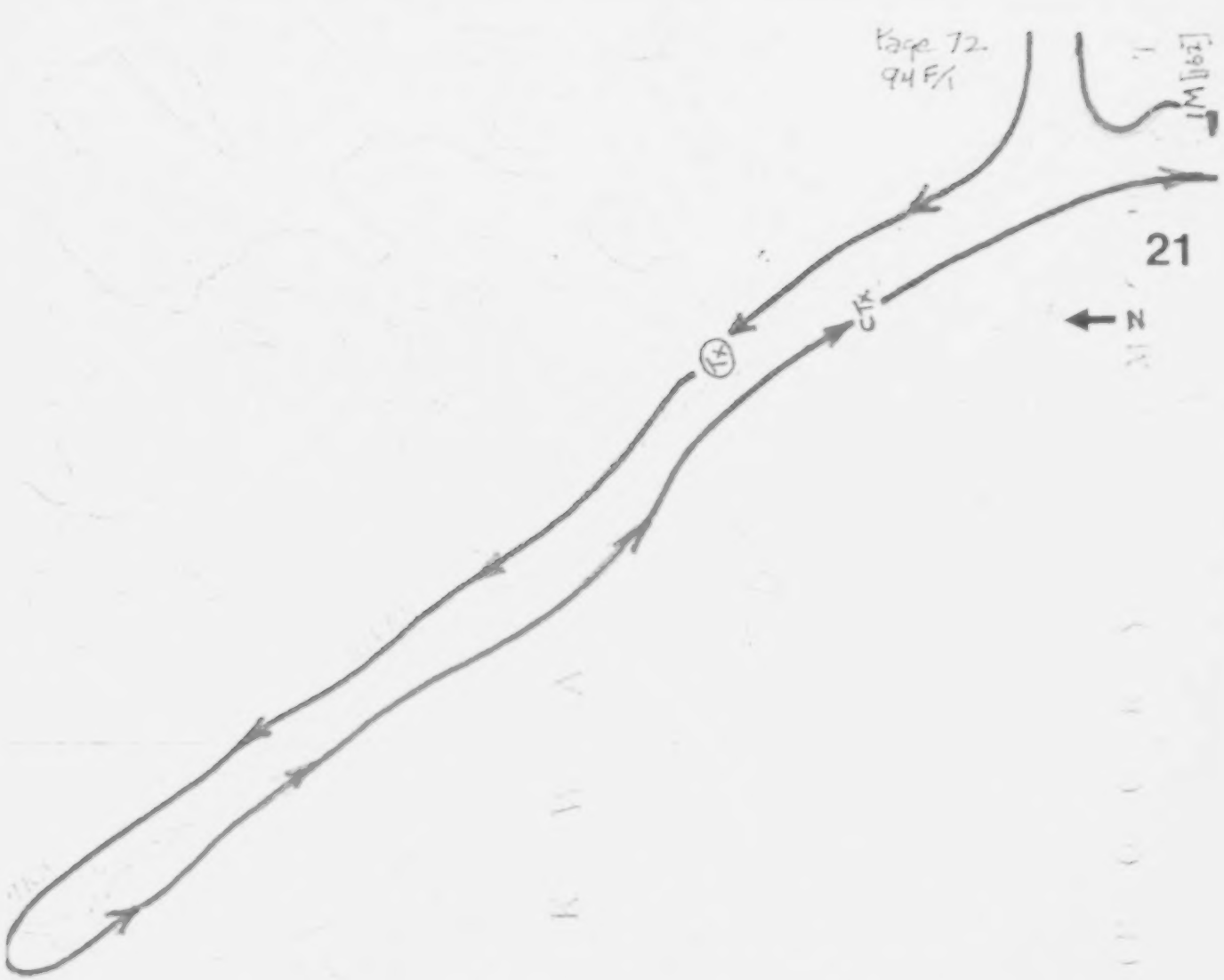
S

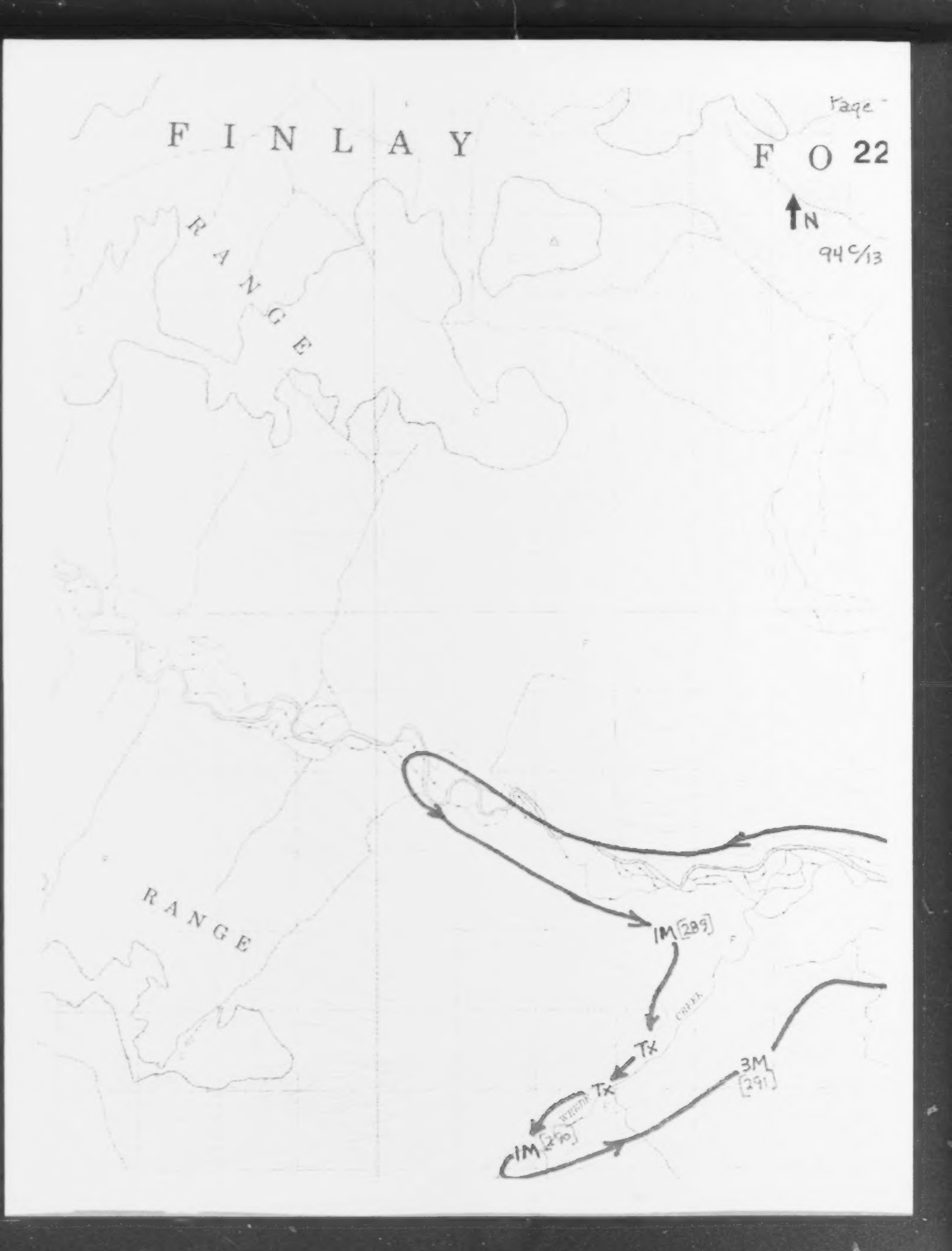
N
94 F/1
SNOW
133 cm

20

N

94 F/1


Kaye 72.
94 F/1
21
N
CTK


FINLAY
RANGE
RANGE
Page
F O 22
N
94 C/13
1M [289]
Tx
Tx
3M [291]
1M [290]

E S T

23

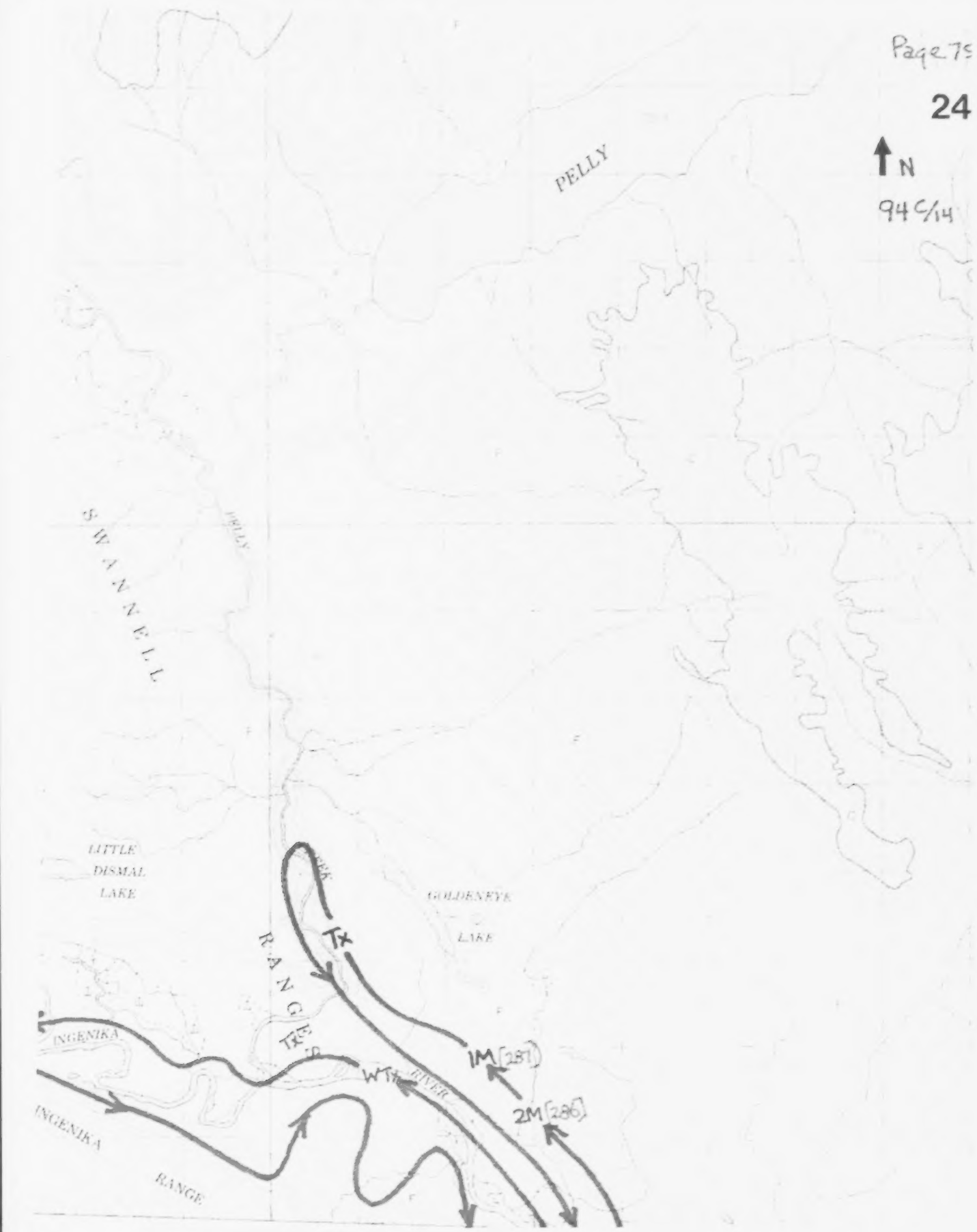
N

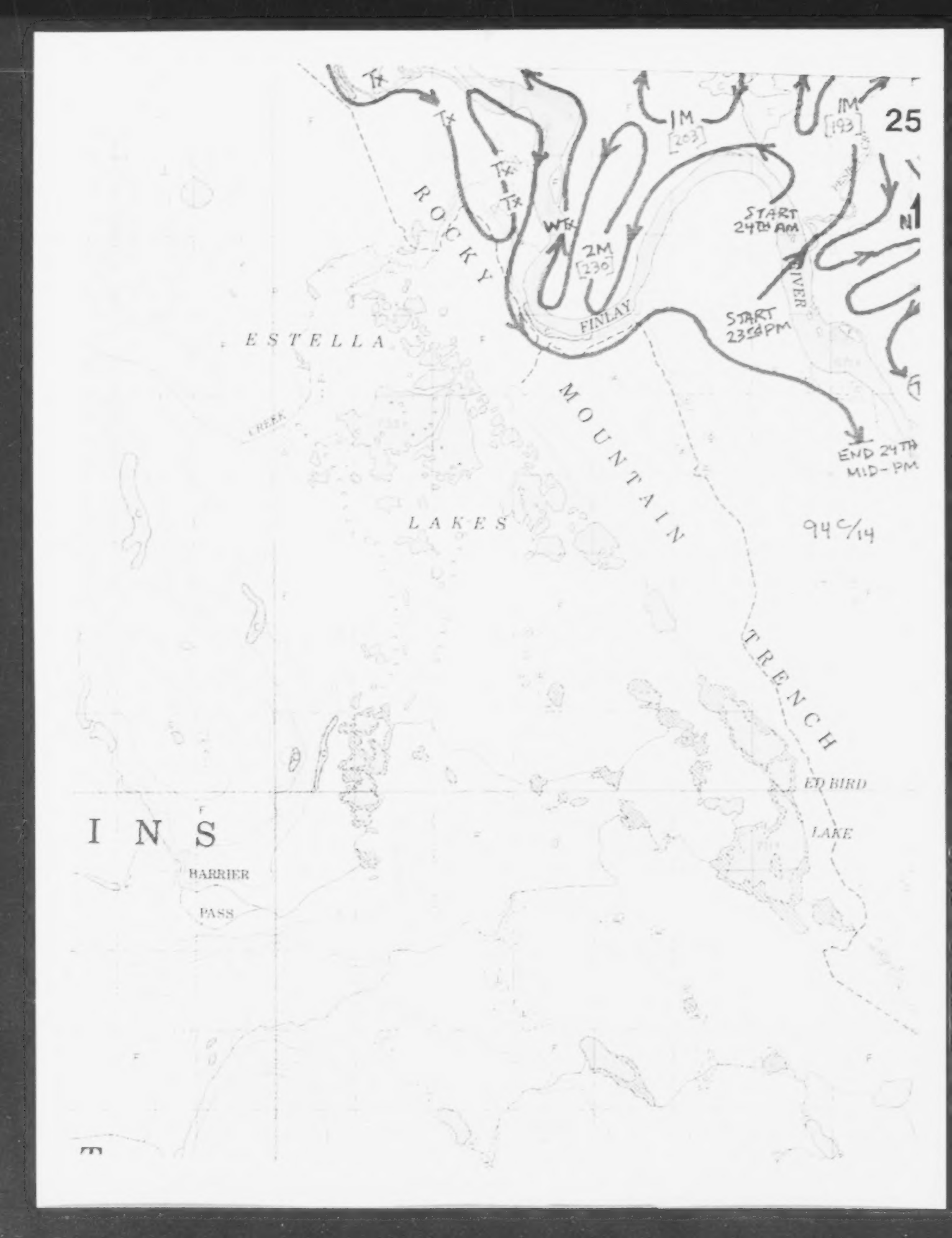
94 C/13

24

N

94 C/14


PELLY
SWANNELL
LITTLE DISMAL LAKE
GOLDENEYE LAKE
RANGE
INGENIKA
INGENIKA RANGE
Tx
WTH
RIVER
1M [287]
2M [286]

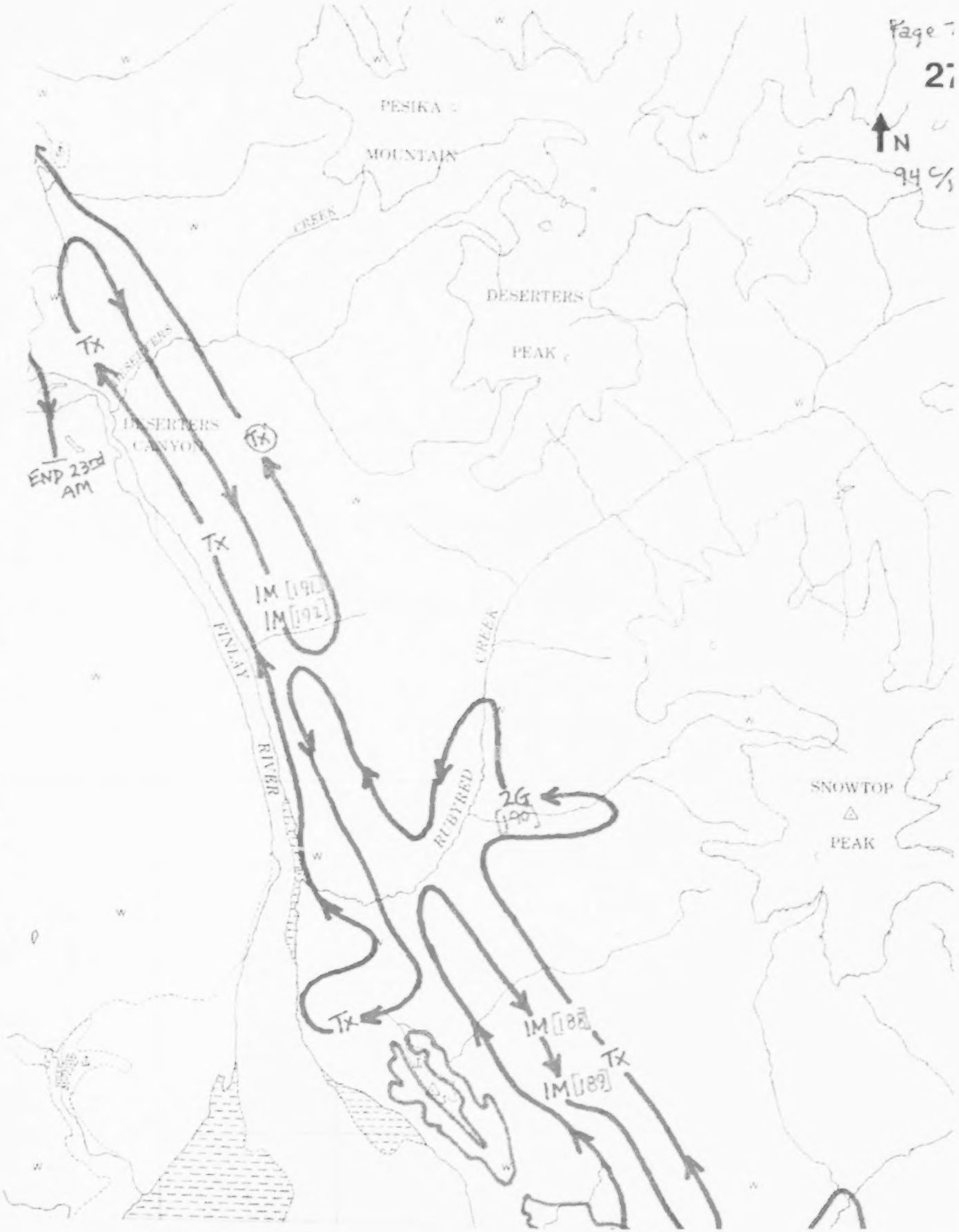

Tx
Tx
Tx-Tx
ROCKY
WTx
2M
[230]
1M
[203]
1M
[193]
25
START
24TH AM
START
23RD PM
FINLAY
RIVER
ESTELLA
CREEK
MOUNTAIN
END 24TH
MID-PM
LAKES
94C/14
TRENCH
ED BIRD
LAKE
I N S
BARRIER
PASS

Page 7:

26

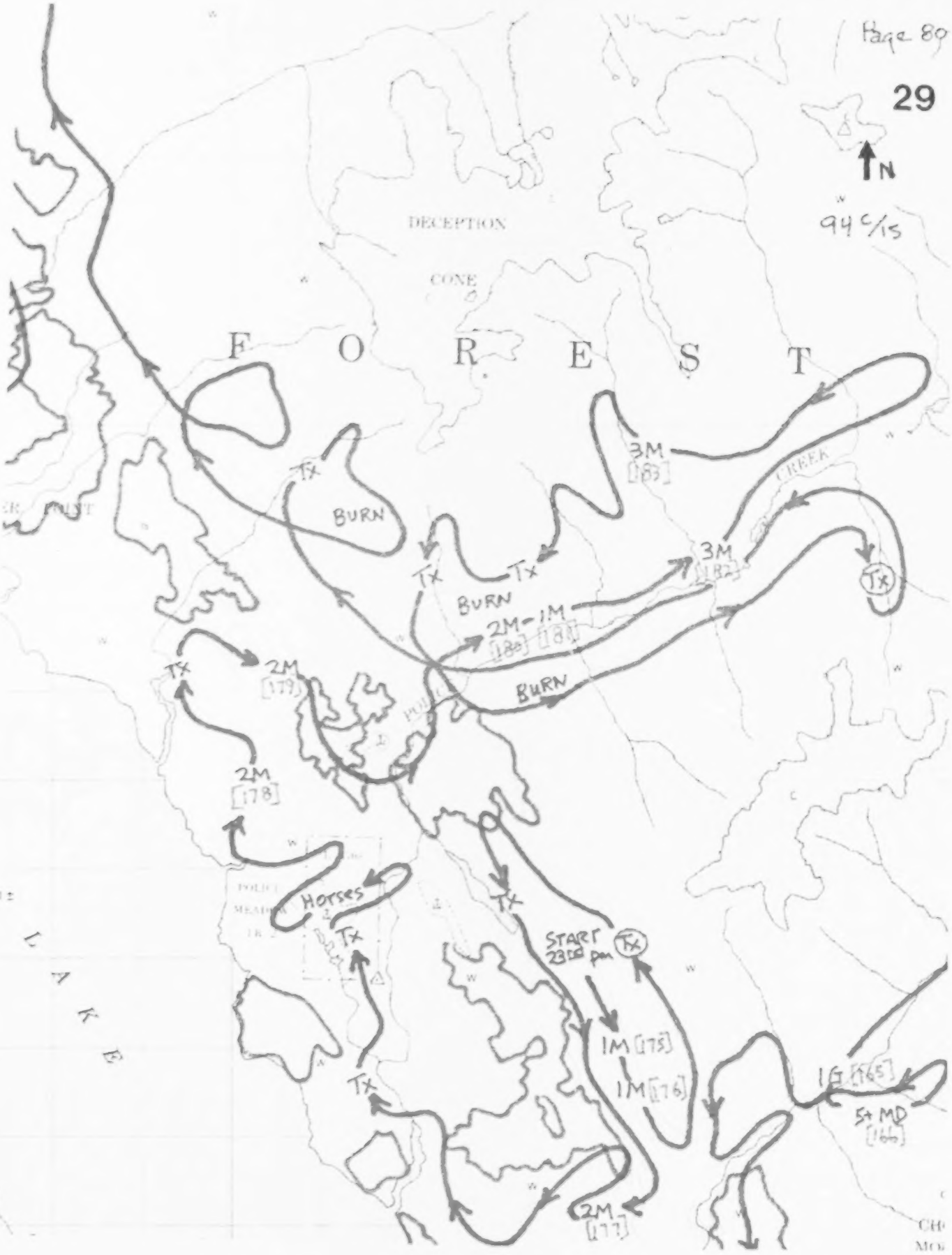
N

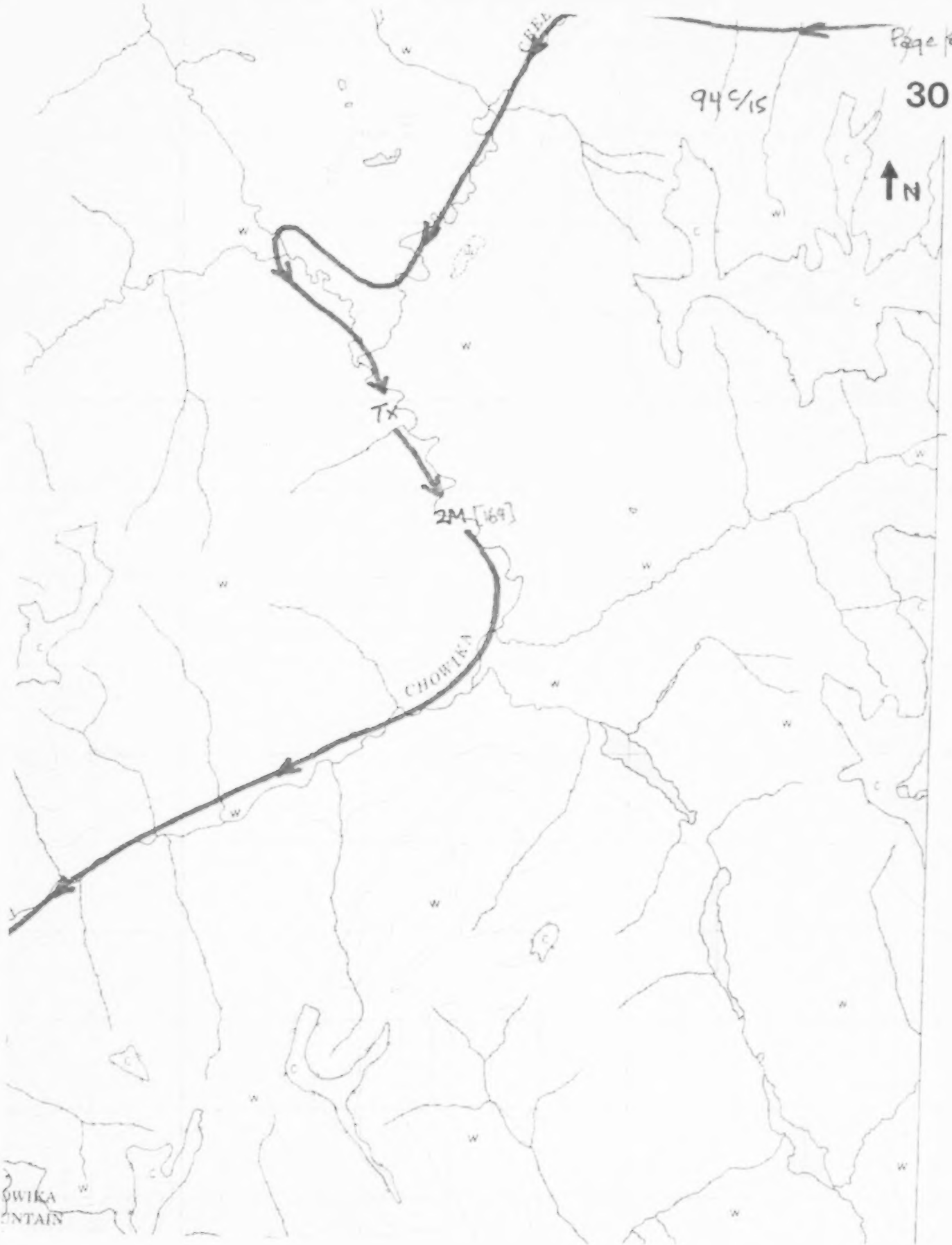
94 C/14


PESIKA
MOUNTAIN
CREEK
DESERTERS
PEAK
DESERTERS
CANYON
END 23rd AM
Tx
Tx
Tx
1M [191]
1M [192]
FINLAY
RIVER
RUBYRED
CREEK
2G [190]
SNOWTOP
PEAK
Tx
1M [188]
Tx
1M [189]
N
94 C/1

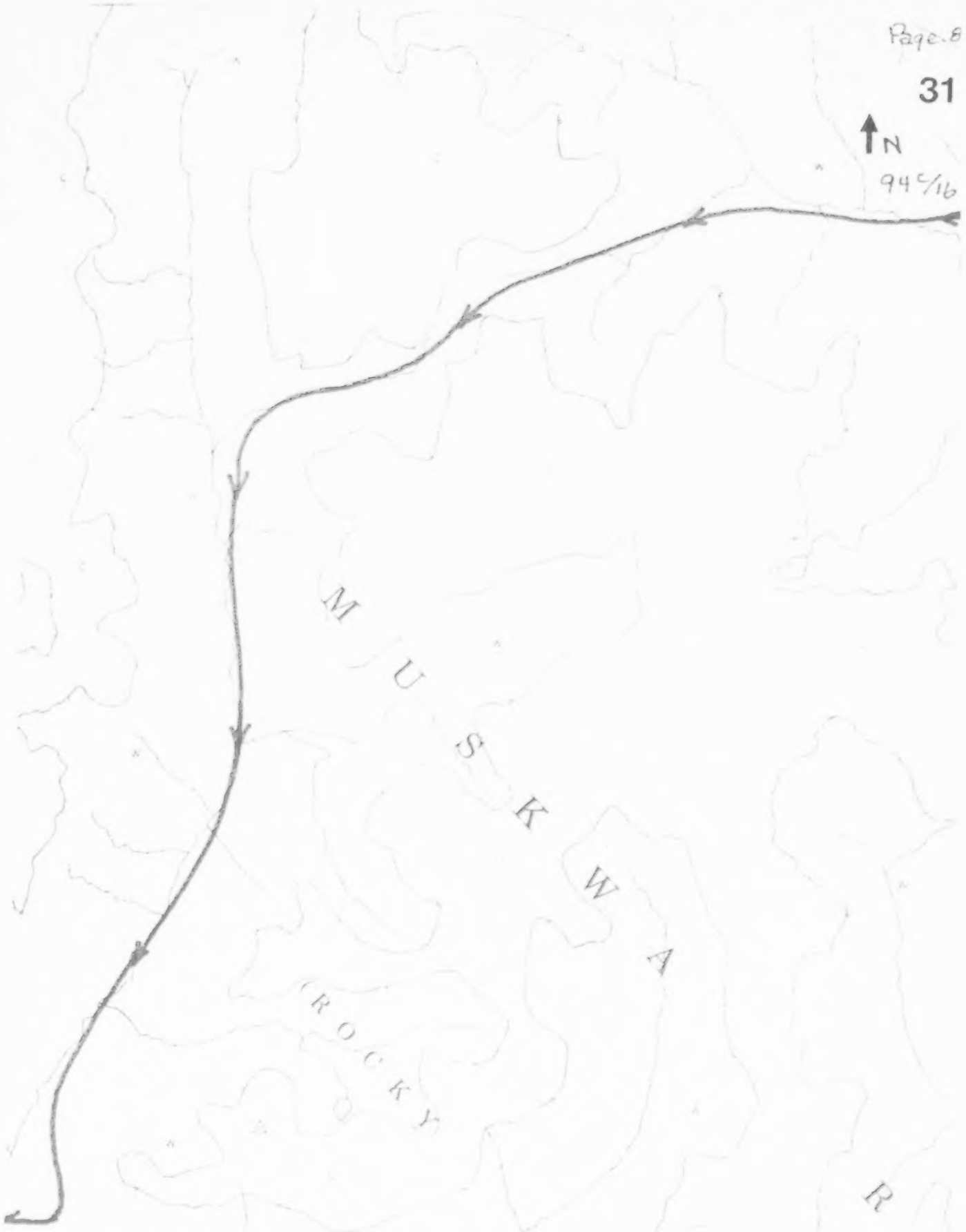
94C/15
28
N
2M
[184]
IVOR
2M-2M
[186] [187]
1M [185]
INGENIKA
POINT
INGENIKA ARM

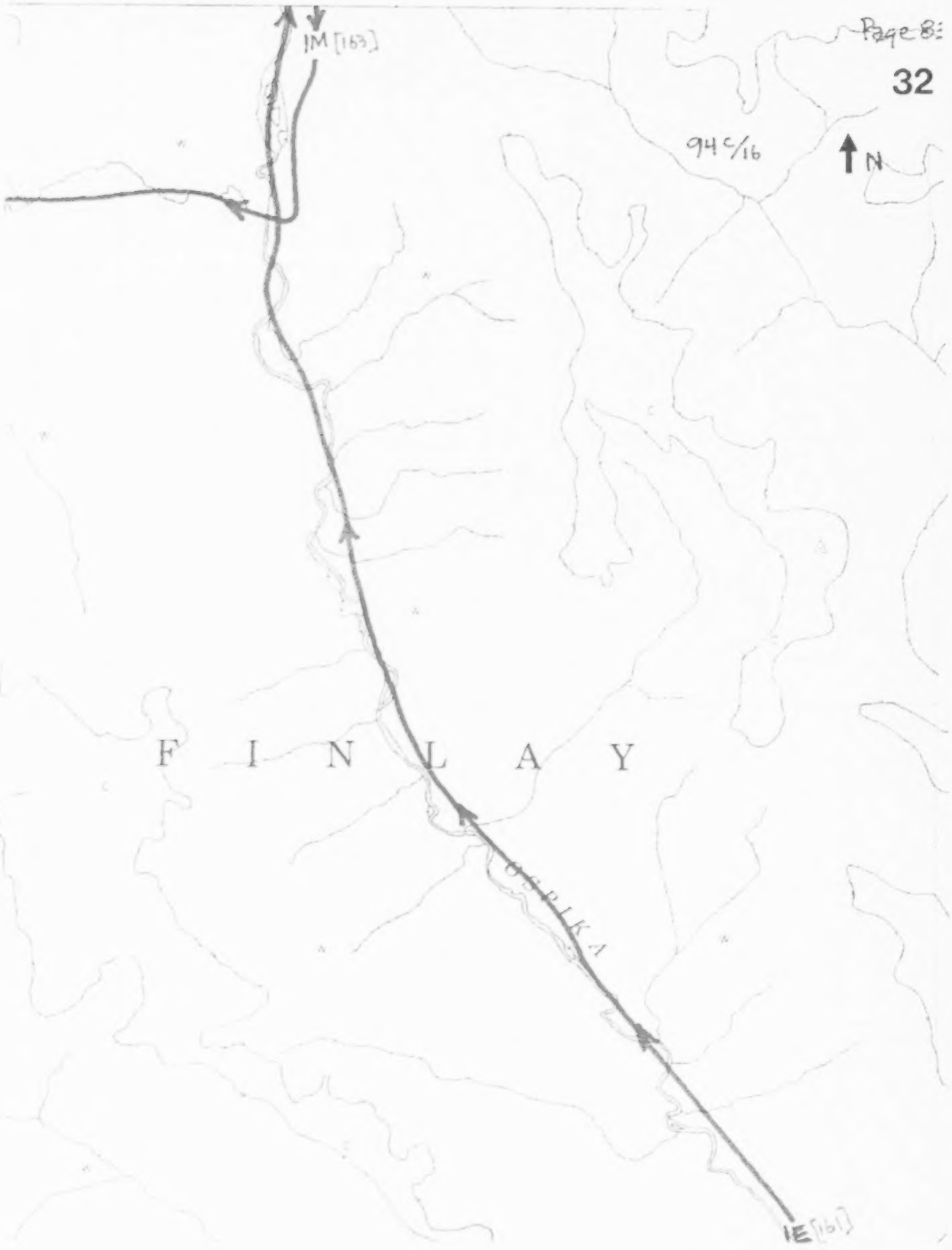
29


N
94 C/15
DECEPTION
CONE
F O R E S T
CREEK
BURN
Tx
3M [183]
3M [182]
2M-1M [180] [181]
2M [179]
2M [178]
Horses
START 23rd pm
1M [175]
1M [176]
1F [165]
5+ MD [166]
2M [177]
LAKE


Page 18
94 C/15
30
N
Tx
2M [169]
CHOWIKA

31




IM [163]
94 C/16
N
F I N L A Y
OSPIKA
IE [161]

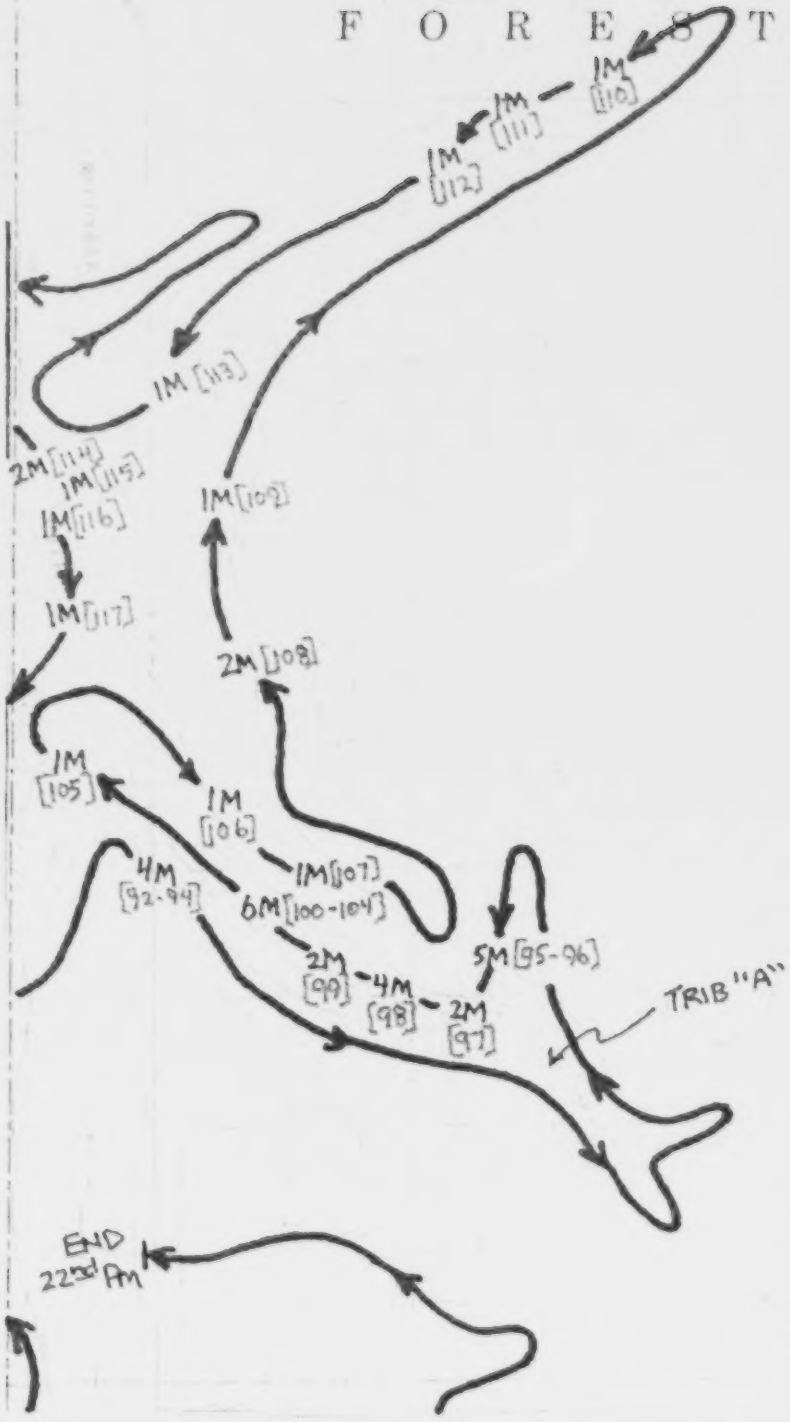
33

RIVER
N
94 5/16
WTX
1M [160]
WV TX
TX
TX
END 21ST AM
1M [118]
2M [119]
1M [120]
3M [24-25]
1M [126]
2M [123]
1M [121]
2M [122]
1M [91]
2M [86]
2M [95]
2M [90]
5M [87-89]
START 22nd AM

(R O C 34

N

94 B/13



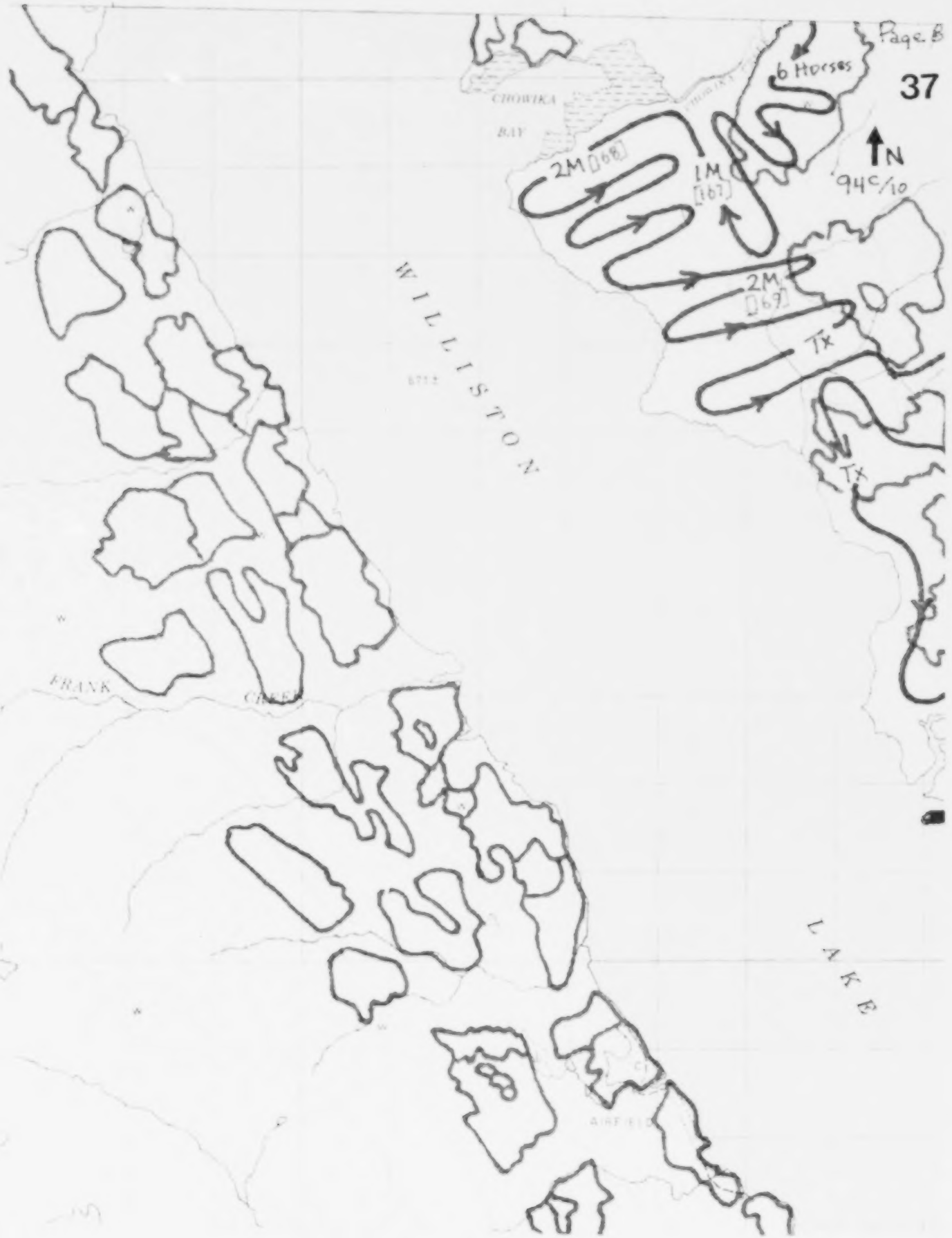
N
94C/11
SWANNELL
RIVER
ANGE

36

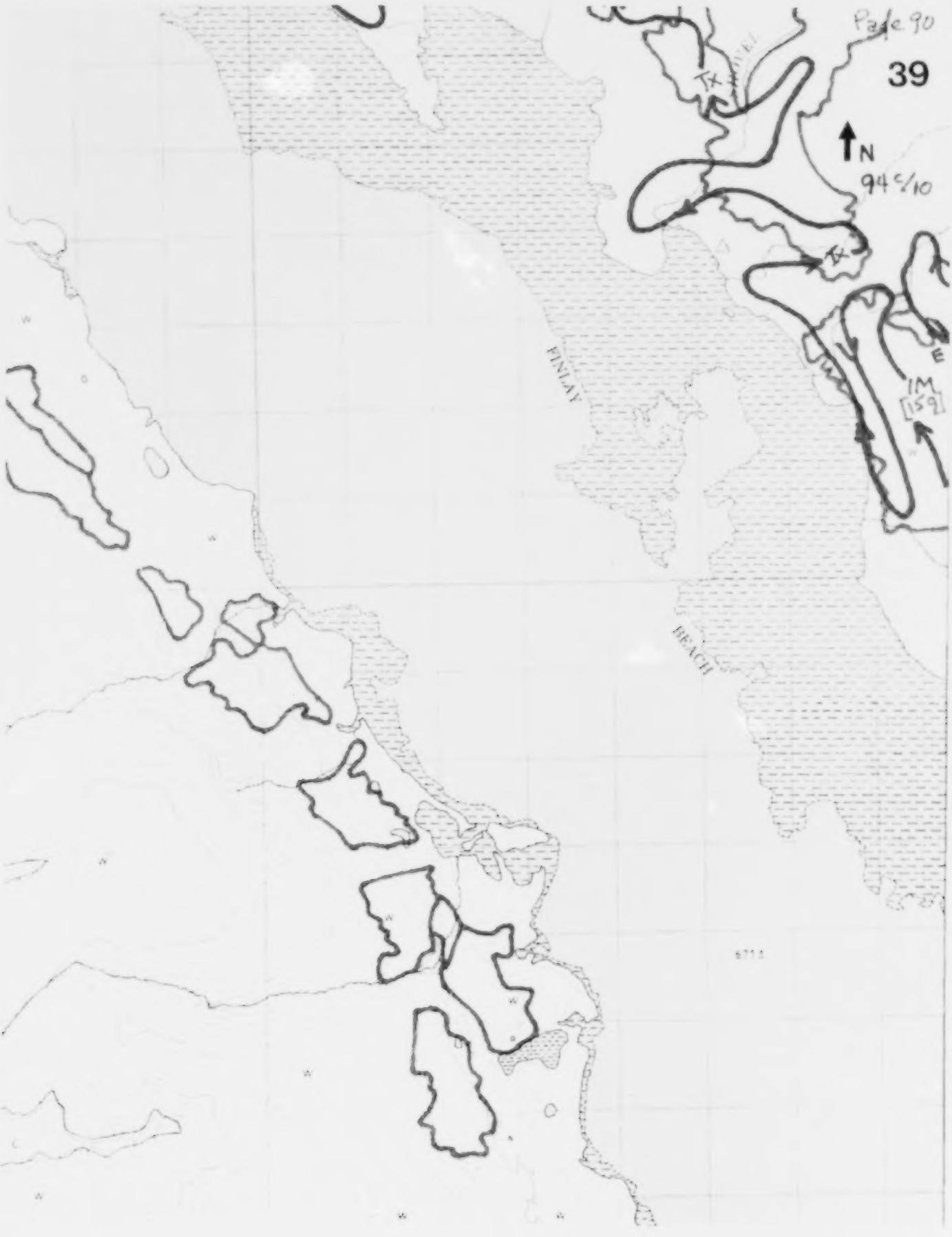
N

94 C/11

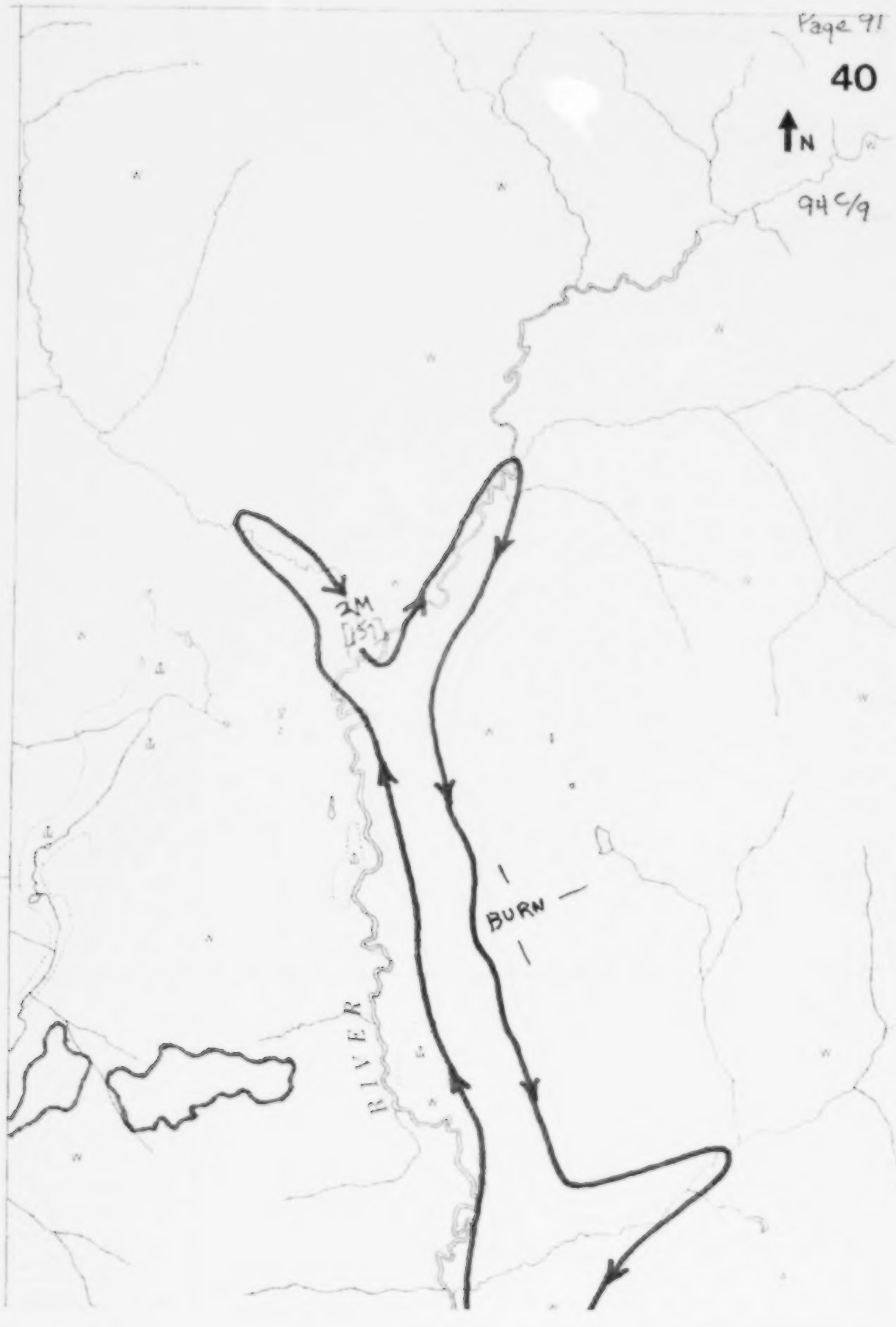
BUTLER
FINLAY
RANGE
INGENIKA MINE
DEKLIZ LAKE
INGENIKA CONE


6 Horses
N
94C/10
2M [68]
1M [67]
2M [69]
Tx
Tx
WILLISTON
CHOWIKA BAY
FRANK
LAKE

38


Page 90
39
N
94 S/10
FINLAY
BEACH
IM
[59]

40



41

N

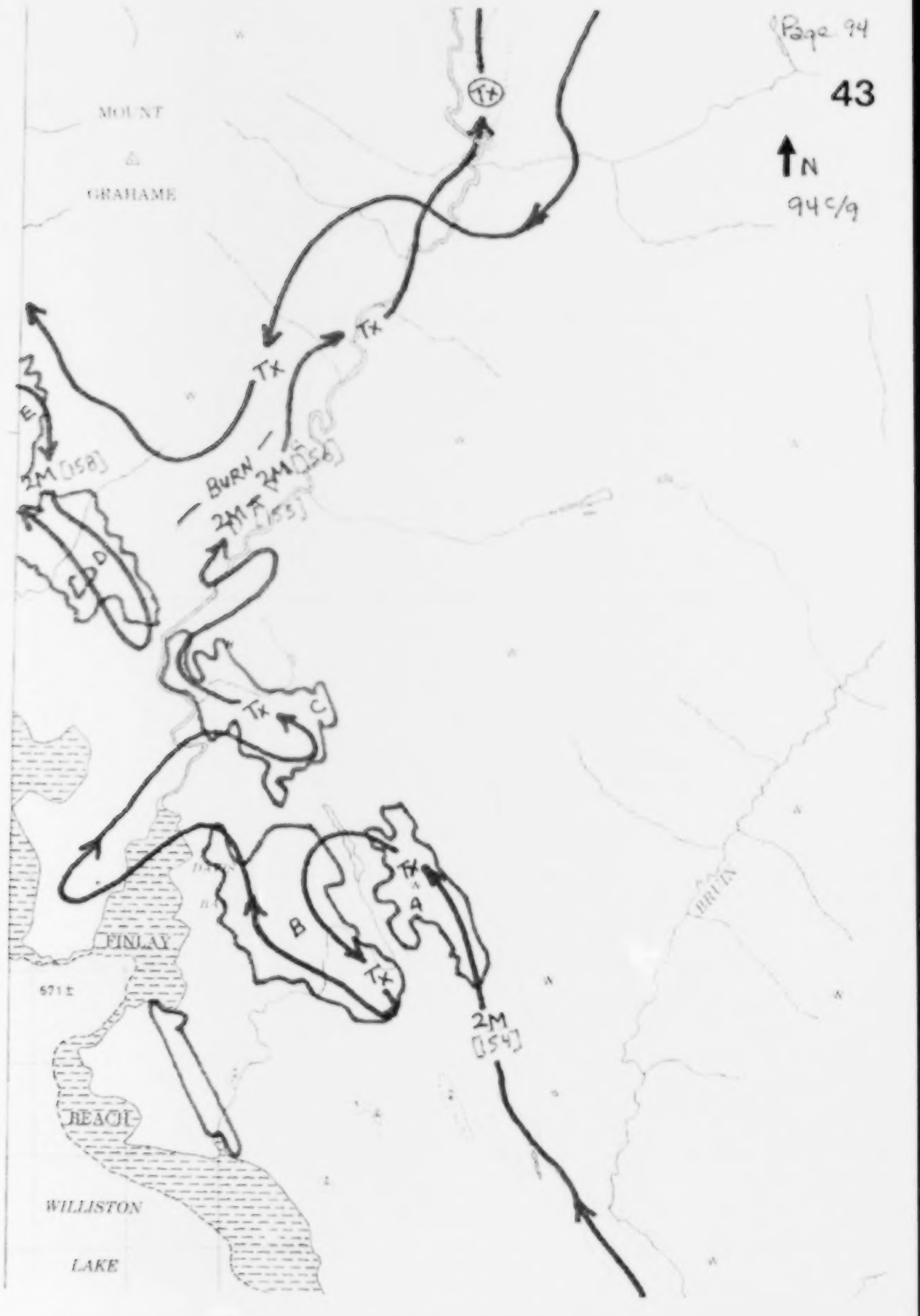
94 c/9

Aborted
(High winds)
1M [84]
1M [83]
1M [82]
42
N
94 c/9
TRIDENT
PEAK
5M [86-8]
4M [75]
1M [74]
SPIPKA
RIVER
USKWA
ROCKY MOUNTAINS
RANGES
START 2220
TRIDENT CRK
BURN
BURN
DISTRICT
LAND

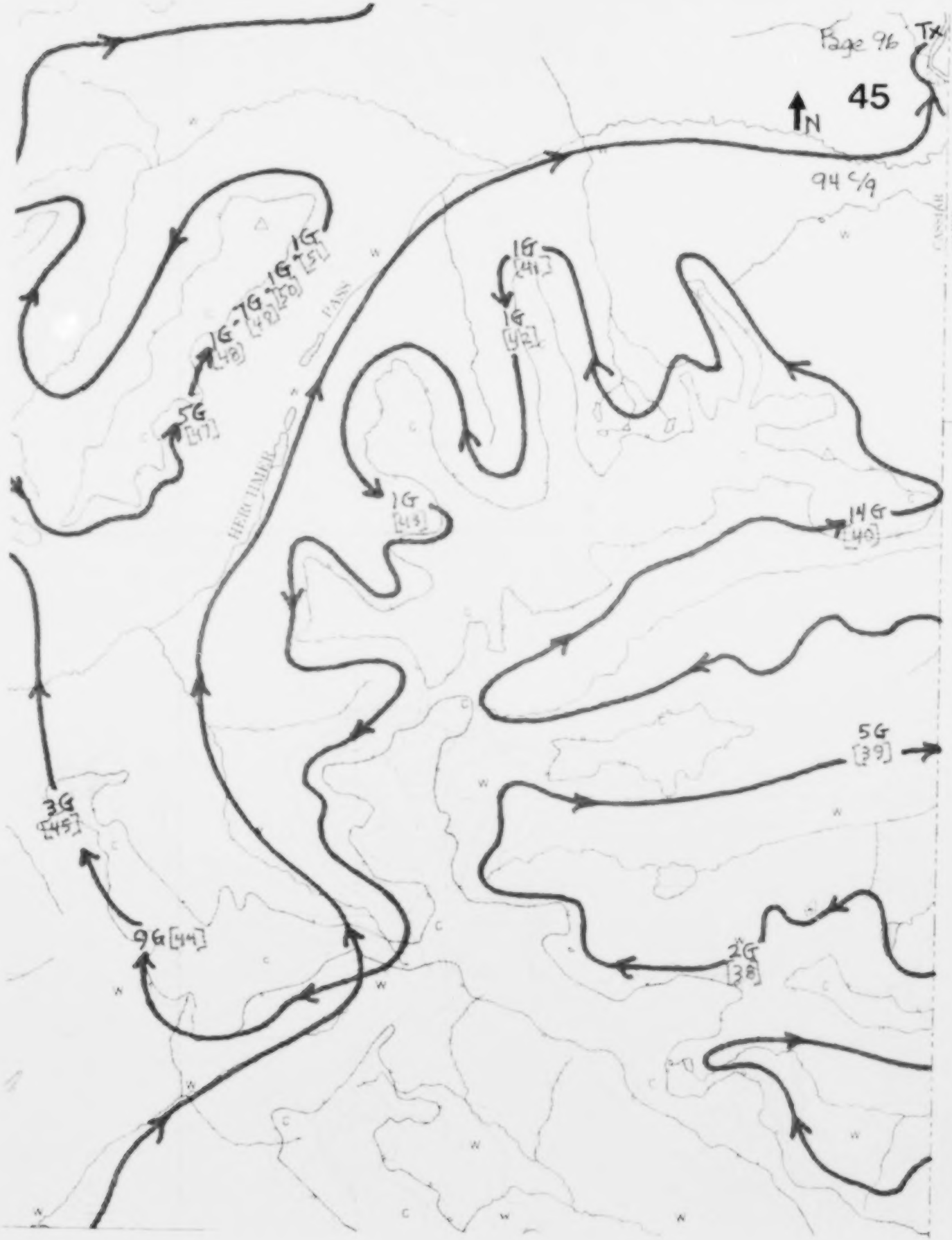
43

N

94 C/9


MOUNT
GRAHAME
Tx
Tx
Tx
E
2M [158]
BURN
2M [153]
2M [156]
D
Tx
C
A
B
Tx
Tx
FINLAY
2M [154]
BEACH
WILLISTON
LAKE

Page 95
44
N
[52]
W
94 c/p
F O R E S T
CREEK
CREEK
COLLINS
2M
[56]
3G
[56]


Page 96
Tx
45
N
94 c/9
1G [51]
1G [50]
1G [49]
1G [48]
5G [47]
1G [41]
1G [42]
1G [43]
14G [40]
5G [39]
2G [38]
3G [45]
9G [44]
HERO TUNNEL
PASS

46

N

94 B/12

LAND DISTRICT

47

N

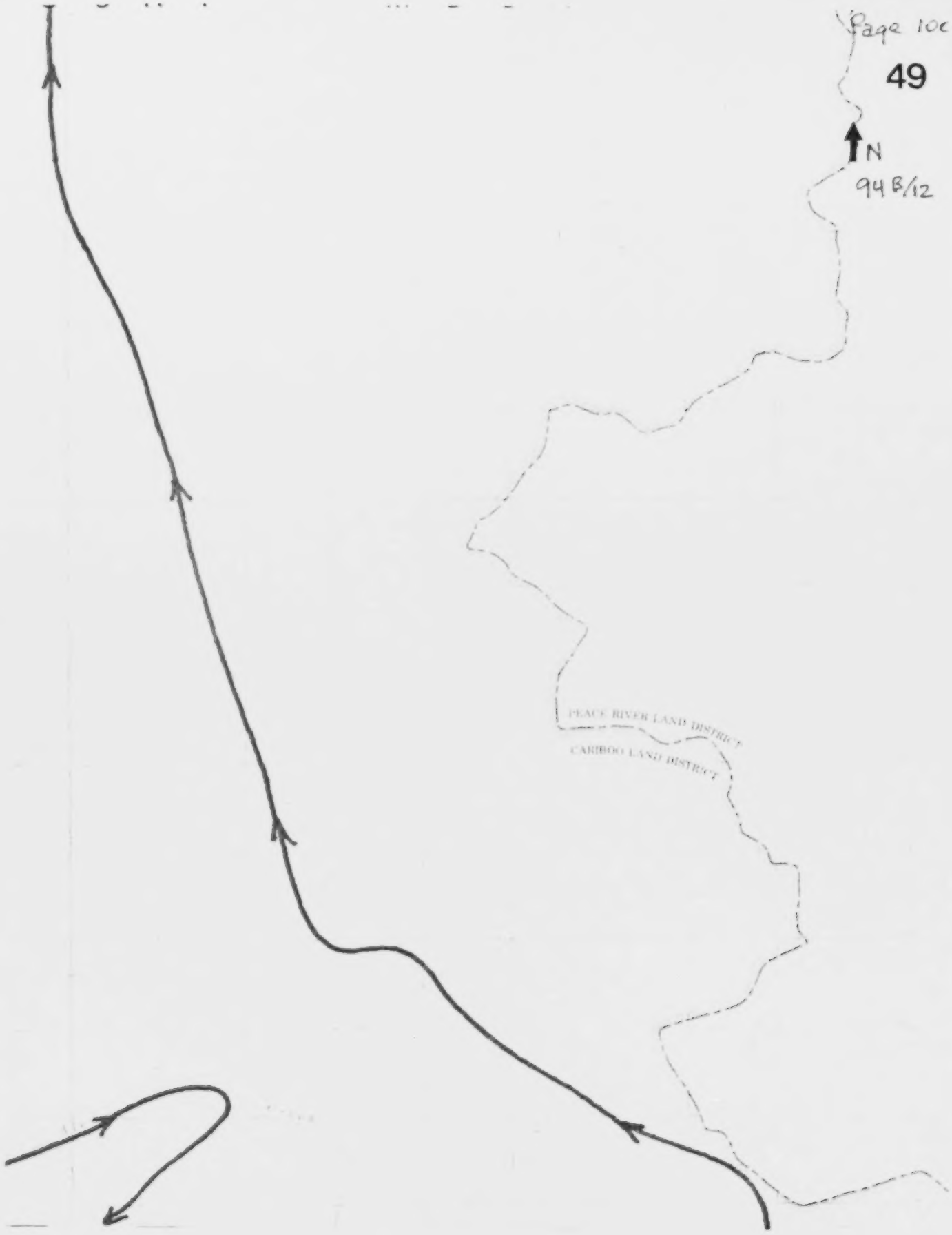
94 B/12

Mount
Lady Laurier
PEACE RIVER LAND DISTRICT
CARIBOO LAND DISTRICT
K W A R A N G E
O C K Y M O U N T A I N S

48

FOREST N

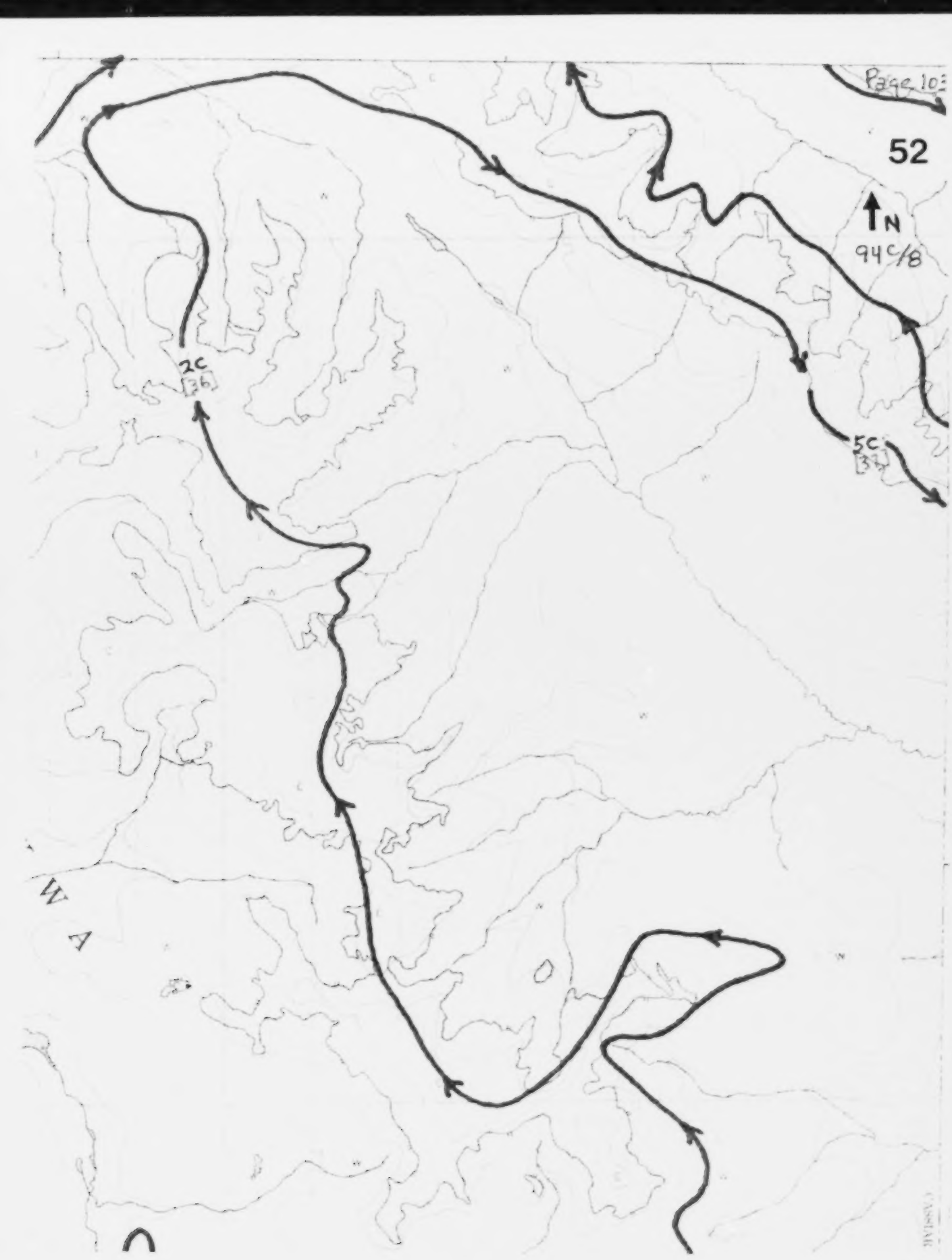
94 B/12


N
94 B/12
PEACE RIVER LAND DISTRICT
CARIBOO LAND DISTRICT

50

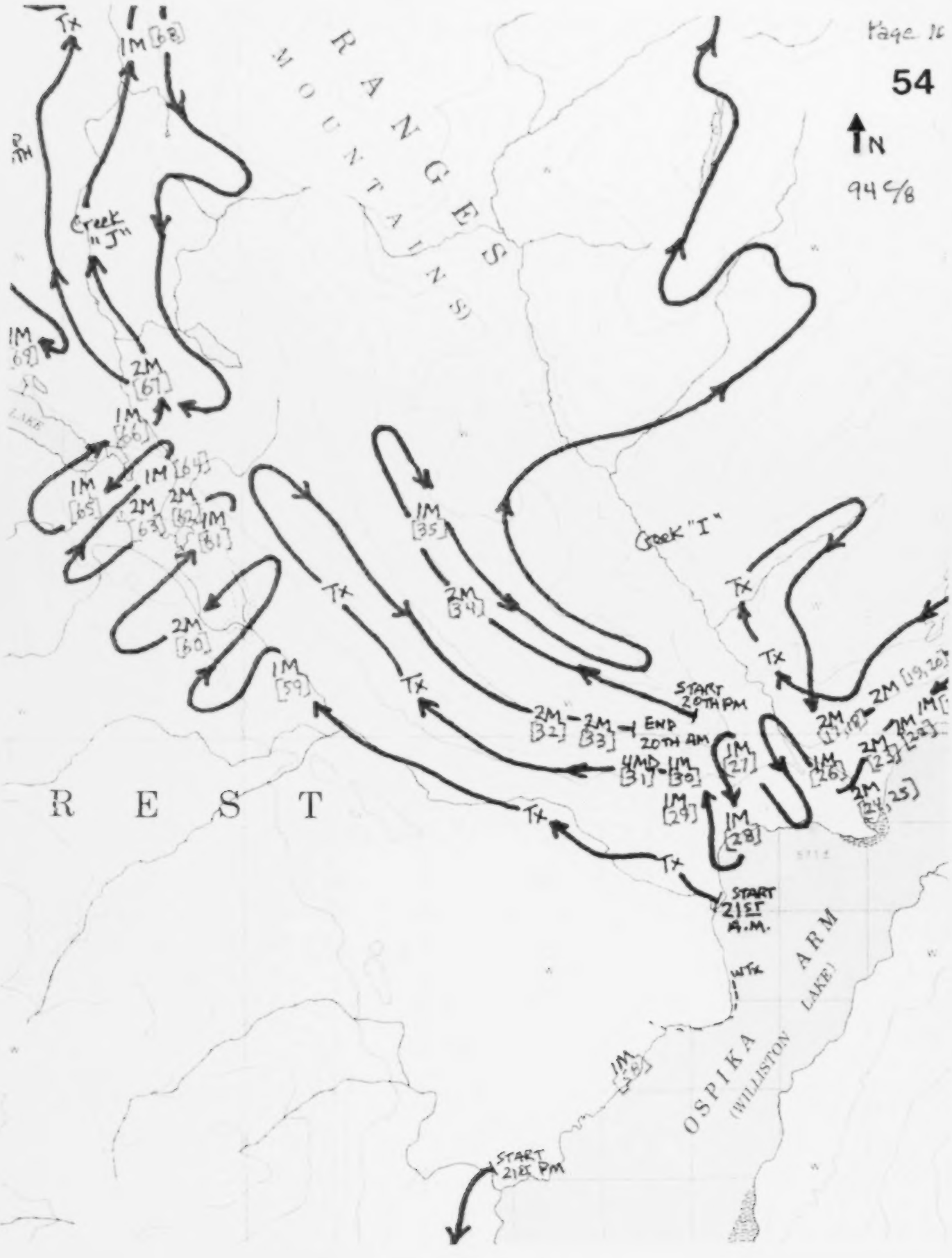
N
94C/8
Thick Timber
BRUCE BAY
2M [153]
1M [152]
K
J
I
2M [151]
H
1M [149]
G
2M [150]
F
1M [148]
E
1M [146]
1M [147]
D
B
C
3M [174]
A
Tx
1M [173]
BVR Tx SYSTEM

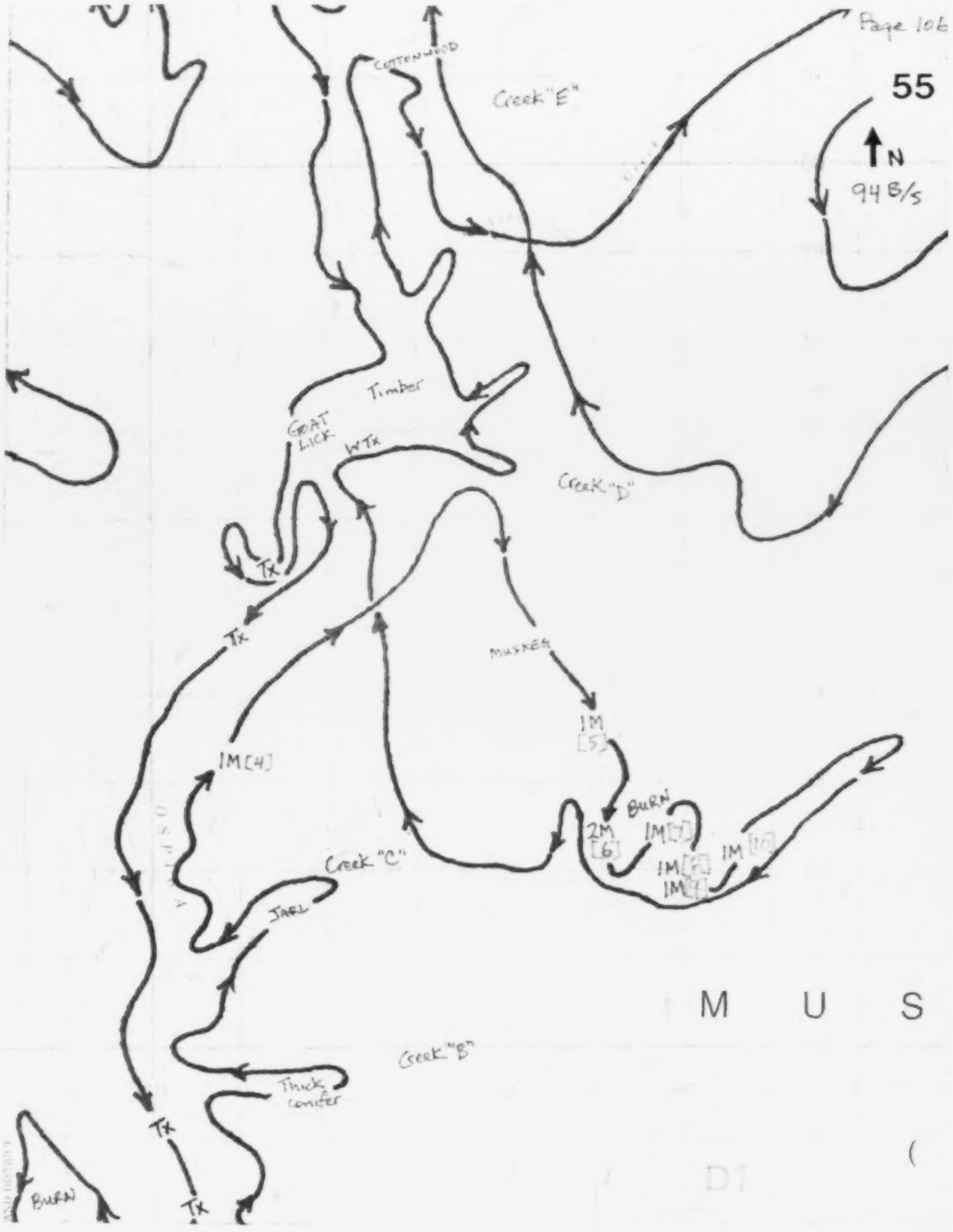
51

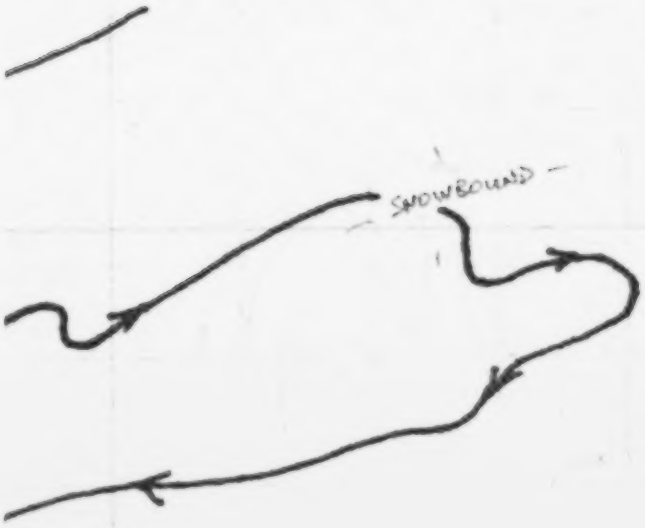

Page 10
52
N
94C/8
2C
[36]
5C
[37]
WA

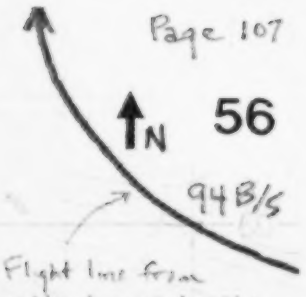
N
53
Tx
Tx
2M [143]
1M [144]
94C/8
1M [145]
2M [142]
1M [141]
BVR SYSTEMS
Tx
Thick Timber
1M [141]
1M [139]
3M [138]
1M [140]
1M [135]
1M [136]
3M [133]
2M [134]
1M [137]
1M [132]
CARRIER POINT
F O

54


N
94 C/8
ROCKY MOUNTAINS
Creek "I"
Creek "J"
Tx
1M [68]
1M [69]
2M [67]
1M [66]
1M [64]
1M [65]
2M [63]
2M [62]
1M [61]
2M [60]
1M [59]
1M [35]
2M [34]
START 20TH PM
2M [32]
2M [33]
END 20TH AM
HMD [31]
HM [30]
1M [29]
1M [28]
1M [27]
1M [26]
2M [1, 18]
2M [19, 20]
2M [22]
2M [23]
2M [24, 25]
START 21ST A.M.
WTx
1M [36]
START 21ST PM
R E S T
OSPIKA (WILLISTON LAKE) ARM


55
N
94 B/S
COTTONWOOD
Creek "E"
Timber
GOAT LICK
WTx
Creek "D"
Tx
Tx
MUSKEG
1M [5]
1M [4]
BURN
2M [6]
1M [7]
1M [8]
1M [9]
1M [10]
Creek "C"
JAIL
Creek "B"
Thick conifer
Tx
Tx
BURN
M U S

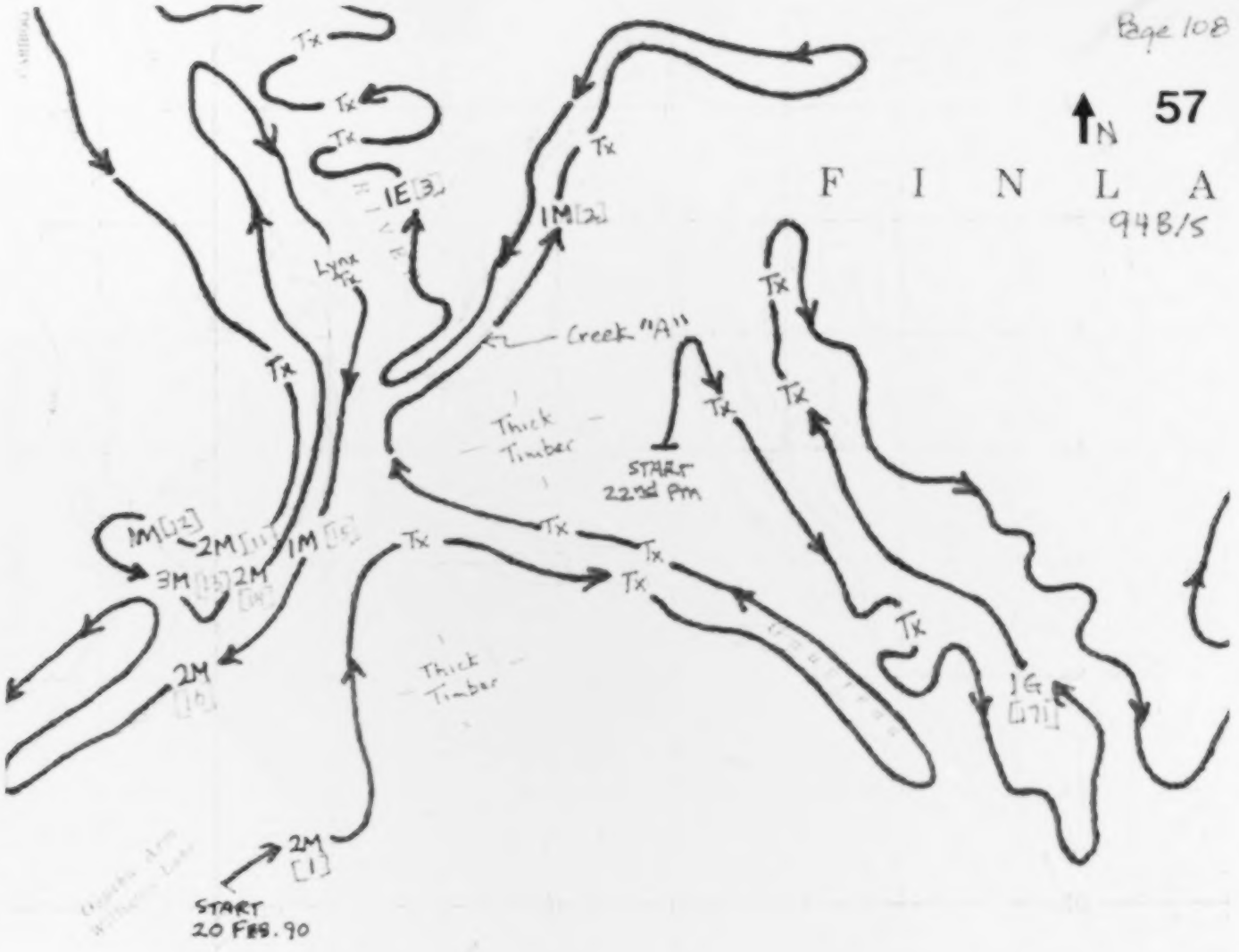




Flight line from uplands near height-of-land; no signif. sightings (see full-sized mapsheet 94B/5

K W A R A N G

R O C K Y M O U N T A I N S)


N
57
F I N L A
94B/5
Tx
1E [3]
1M [2]
Creek "A"
Thick Timber
START 22nd PM
1M [12]
2M [11]
1M [9]
3M [15]
2M [14]
2M [16]
Thick Timber
1G [17]
2M [1]
START 20 FEB. 90

N
58
94B/5
Y
F O R E S T
To height of land:
no signif obs

59

N

94C/1